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Grinding Practices from Several Railroad Shops

By Frank C. Hudson

GRINDING operations in the railroad shop cover a wide variety of work and while the growth of this method of finishing has not been as rapid as in many manufacturing plants, the grinding process is becoming more common and will probably continue to extend its usefulness into many other operations. Perhaps one of the most common uses of the grinding machine is in surfacing locomotive guides and similar parts on a machine using a large cup, or ring, wheel, as in Fig. 1. These machines are used both in finishing guides from the rough, as they come from the forge, without preliminary machining and also for refinishing worn guides in service. There are, of course, various methods of holding the work, the object being to hold it squarely and firmly, and to locate it and clamp it quickly. The guides are usually located by suitable stops on the grinding machine table and the clamps shown in Fig. 1 may be considered as being typical.

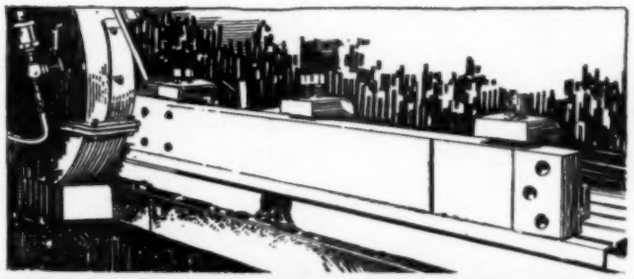


Fig. 1—Grinding guide bars for locomotives by a ring wheel in a horizontal machine. The guide is held to the table by the heavy clamps shown. It is located against stops on the back side.

Fig. 2—Grinding locomotive valve-gear links, using a magnetic chuck. The links rest on the table which takes the thrust of the cut. Two links are surfaced on both sides in 35 minutes

The sides of valve-motion links are frequently surfaced on the same type of grinder, using a large ring wheel as in Fig. 2. This illustration shows a very useful application of the magnetic chuck, which has many advantages in this kind of work. Here the thrust of the cutting action of the grinding wheel is taken by the table of the machine, the magnetic chuck simply holding the links in the right position to insure the sides being parallel. In some cases the work is supported by studs on the chuck face. In the job shown, the two links are surfaced on both sides in 35 min. A third application of the same type of grinder is shown in Fig. 3, where keys for main and side rods are being ground. The keys are forged to close dimensions, $\frac{1}{16}$ in. being left for finish. Here again, the magnetic chuck is used and ten keys are ground at each setting. These ten keys are divided in two groups of five keys each, the lower five being supported by blocks on the table, and similar blocks separating the two groups. The tolerance permitted is approximately 0.010 in. All four sides are finished, the batch of ten keys being ground all over in one hour. It is difficult to see how a job of this kind could be finished in this time by any other method.

Crosshead and crankpin collars are also finished on this machine. They are cut out of boiler plate and eight pieces are held at once on the same magnetic chuck. Both sides are ground in 30 min. Shoes and wedges are also ground on the outside on machines of this type, in some shops, as shown in Fig. 4. They are usually held by clamping against an angle plate, suitably located on the grinding-machine table.

Another application of grinding is shown in Figs. 5,

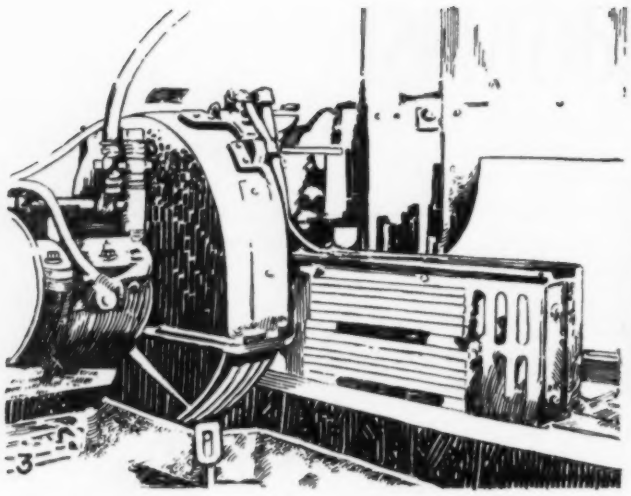


Fig. 3—Finishing keys for main and side rods on a large surface grinder. Ten keys are held on the magnetic chuck in groups of five each. About ☆-in. is left for grinding.

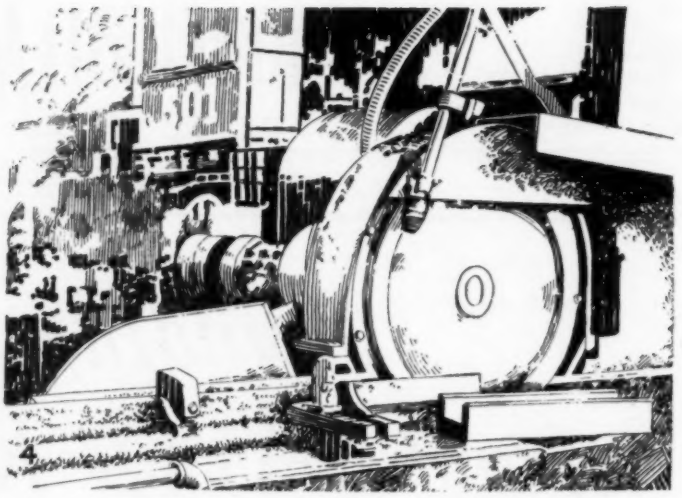


Fig. 4—Grinding shoes and wedges. The work is held against angles on the grinder table by means of heavy C-clamps at both ends of the shoes or wedges

6 and 7. Here the mating surfaces of cylinders and cylinder heads are being ground to a steam-tight surface, utilizing different methods of imparting the oscillating motion desired. In the first instance, Fig. 5, motion is derived from the air drill, *A*, which drives the disk, *B*, having a crankpin to which the rod *C* is connected. The amount of movement of the head can be regulated by the position of the rod *C* in the arm *D* that is fastened to the cylinder head. This practice is from the Denver & Rio Grande Western. A similar device, in which the air drill drives a small crankshaft, is shown in Fig. 6, from the El Paso shop of the Southern Pacific Railroad. This illustration shows the air drill and its connection, mounted on a base so as to be easily carried to any track.

A third device for grinding in valve-chamber heads is shown in Fig. 7. A double-acting air cylinder has been arranged with suitable valves to reverse the direction of the air in the cylinder. The reversal gives the oscillation to the head. The apparatus is portable and can easily be taken to the locomotive.

Finishing the working surfaces of casehardened valve-motion links, blocks, pins and bushings, is almost invariably by grinding. It has been the practice on links for many years, and several link grinding machines are manufactured. There are also a variety of shop-made devices for link grinding.

Link grinding machines are of two general types, horizontal and vertical, with radius bars that have adjust-

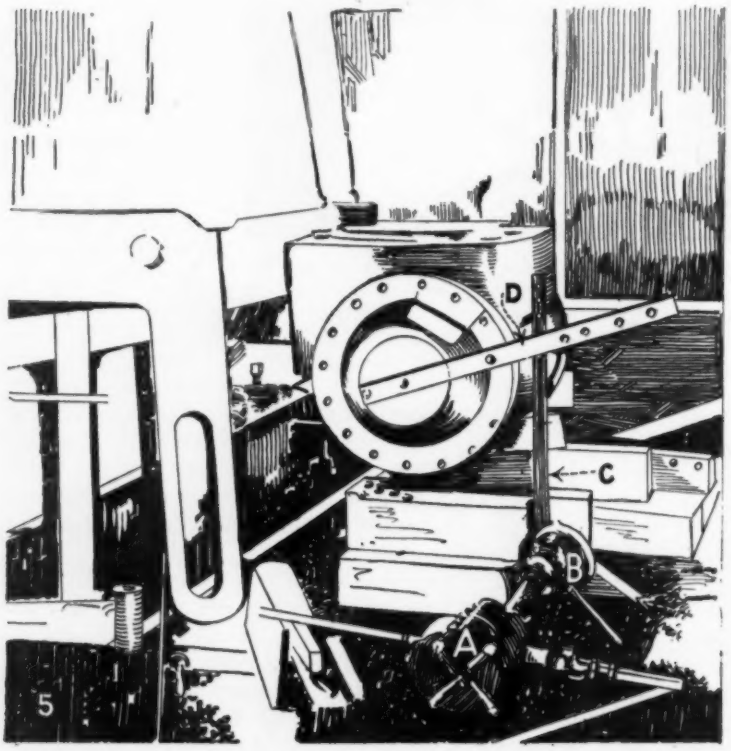


Fig. 5—Grinding-in a cylinder head. An air-drill motor is used in connection with a disk that carries a crankpin, and so gives an oscillating motion to the head.

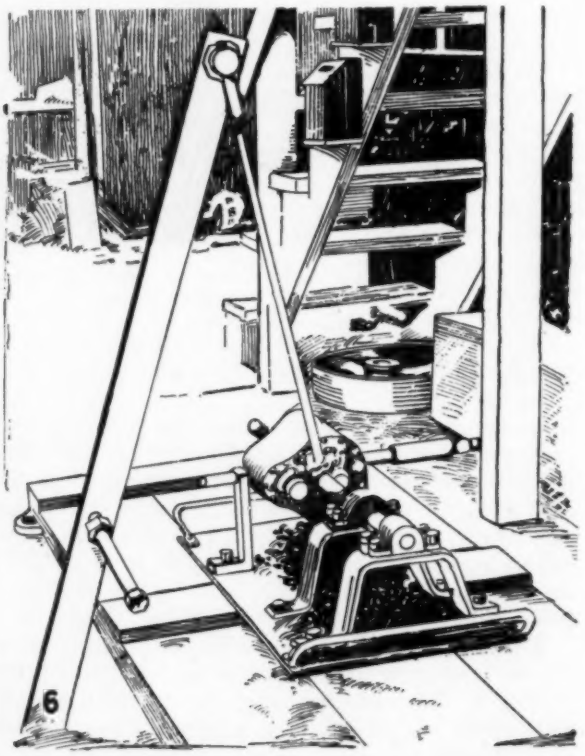
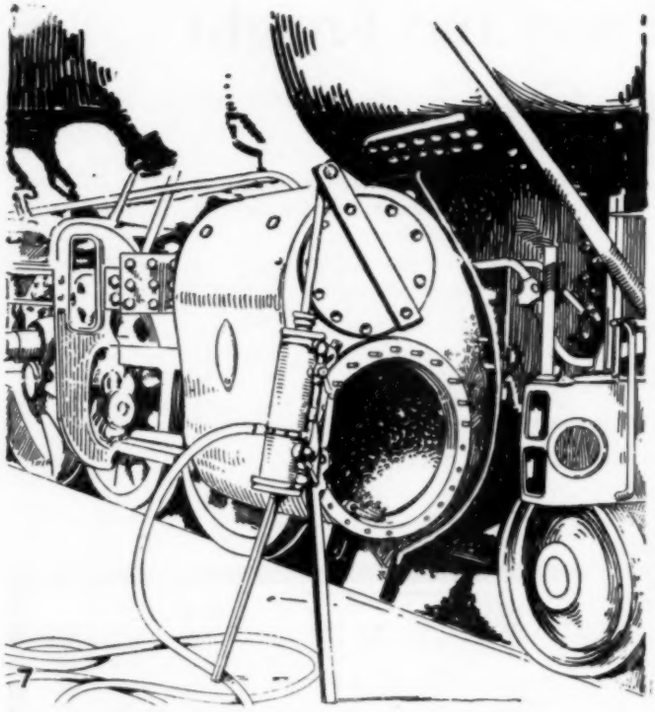


Fig. 6—Another application of an air motor to grinding-in cylinder heads. In this device a crankshaft is used and the whole affair is mounted on a portable base



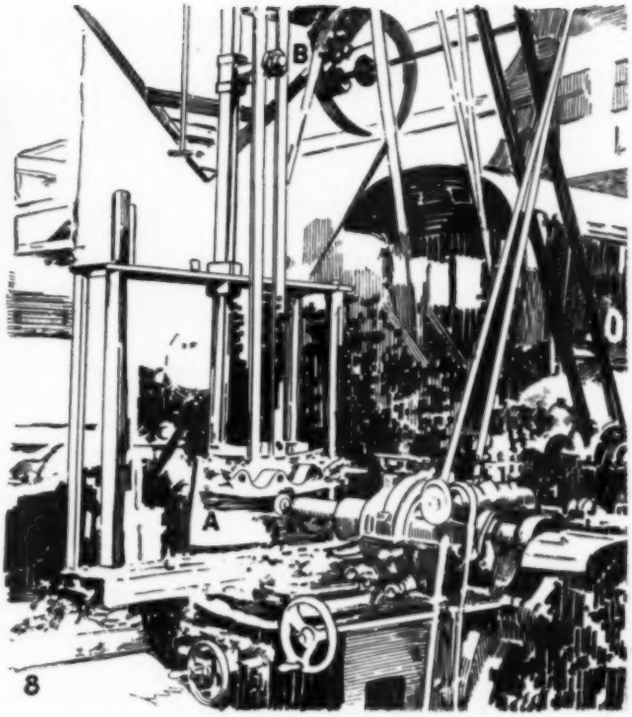


Fig. 7—Grinding-in a steam-chest head with a reciprocating motor. The air cylinder is mounted on a two legged stand that oscillates so that the piston rod can follow the arc described by the crank. Fig. 8—Grinding links on a horizontal-spindle machine of the internal type. A framework is built up to carry the radius bar

able fulcrums to suit the different valve motions. Then there is the type of link grinder where the arc is secured by holding the link in a carriage that rolls on opposed inclines and gives a close approximation to the desired arc.

In all the link grinding machines, one of the difficulties is in securing a sufficient speed to the wheel to give the best cutting speed, for the wheel is limited in diameter in order to go into the link slot. Both the speed and the kind of wheel have a great effect on the time required, as well as on the finish secured. As the machines generally used are commercial products, there is little need of illustrating them. An adaptation of an internal grinder to finishing links is, however, shown in Fig. 8. Here the link is suspended on the lower end of a radius bar, as at *A*, the fulcrum being positioned on the vertical frame at *B*. The feed is secured from the grinding-machine table, which moves the plate *A*.

Piston-rod grinding machines are now quite common in railroad shops of fair size. They usually handle the piston rod and head complete and this method of finishing seems to have no real rival, for while some shops use a roller tool for the final finish, the practice is no longer at all common.

On crankpins and similar work, however, the rolling process has been so long established that, although grinding is making progress, it has not been as rapid as in other fields. The rolled, or burnished, surface has been considered highly desirable by many, and the fact that it could be finished in the same lathe that turned it, made it seem an economical process. Grinding is, however, gaining ground and work is being finished in less time than before. Crankpins of 9 and 10-in. diameter are finished by grinding in 2¼-hr. as against 3¾-hr. by the old method of turning and rolling.

Lettering Shop Drawings—*Discussion*

By Frank M. Tuohy

I READ with a great deal of interest the article by Charles S. Hazard, under the title given above, on page 799, Vol. 67, of the *American Machinist*. I heartily agree with Mr. Hazard, but I believe the difficulty lies even deeper in our educational system than he has brought out. The desire to have the students produce good-looking, neat and artistic drawings tends to cause them to overlook the importance of dimensions. By the time they have produced satisfactorily appearing drawings they find themselves in a rush to get them finished on time, and as dimensions, notes and titles are usually the last thing they add, they rush these through as a sort of afterthought. This habit they unfortunately carry through life unless it is not forcibly corrected.

The solution lies not only in the type of letters used, but in using much larger letters and figures than are now current practice. In addition, free-hand sketching and a greater disregard for appearance in favor of legibility of figures and letters should be encouraged. The dimensions and notes on a drawing are of far greater importance to the shop man than the picture, and it is here that the emphasis should really be placed. A rough picture with large, clear, legible dimensions and notes, is a much more practical drawing in a machine shop than a neat, fancy print with trick letters and figures that are soon obliterated by the oil and grease in the shop.

Where Passenger Fares and Freight Charges Go

THE illustration below is a reproduction of the third annual calendar—showing where freight rates and passenger fares go—published by the Committee on Public Relations of the Eastern Railroads. The original, lithographed in eleven colors, is of a large poster size, which will be displayed in stations and elsewhere generally by the Eastern railroads.

The calendar is based upon data furnished by the Bureau of Railway Economics. The distribution showing where freight rates and passenger fares go was arrived at as follows: The bureau took the total gross operating revenues of the Class I railroads for the last year available (1926), and divided them by the 366 days in the year 1928. It then computed in terms of average daily gross receipts the number of days taken by each item of expenditure.

A comparison of the 1928 calendar with that for the two preceding years shows the following:

Items of Expenditure	1928	1927	1926
Wages	151	153	157
Locomotive fuel	24	24	27
Materials and supplies	69	69	70
All other operating expenses	24	25	24
Taxes	22	21	21
Interest and rents (fixed charges)	40	41	41
Dividends	23	20	19
Surplus	13	12	6

· EXECUTIVE · FORUM ·

Executives are invited to discuss the problem involved in the following case
Accepted contributions will be paid for

Making Orders Contingent on Swapping Machines

HENRY BROWNELL, head of the Coney Drill Company, was confronted by a problem that has stumped many another executive. Business was none too good and here he was considering the rejection of an order from a large concern. And why? Because the aforementioned large concern would place the order only on condition that one of its machines be ordered in return.

Brownell opposed the conditions while his banker thought it was "good business to buy from your own customers," as he put it, with the result that they asked Mr. Holland to discuss the case.

"Ever run across cases of this kind, Mr. Holland?" said the banker after the situation had been made clear.

"Too often, Mr. Clayton. It's a well known practice of some fairly large concerns. They call it reciprocity or some other high sounding name."

"Looks like good business to me, Mr. Holland. What's the objection to it?"

"You have Meister vaults in your bank I believe, Mr. Clayton?"

"Yes, but what's that got to do with this case?"

"I assume you bought Meister vaults because you thought they were best for your needs."

"Yes, of course. But—"

"Now just suppose another maker of vaults came to you and wanted to do business. Wanted to use your bank as his depository and in other ways. But before doing business with you he insisted that you buy his vaults, now or later."

"I'd tell him we had found the Meister best for our needs and that we couldn't do business on that basis."

"Well, don't you see, Mr. Clayton, that's just the way Mr. Brownell feels about these other machines. He doesn't want to load up his shop with machines that he doesn't feel are the best for his work.

"It's even more important for him to have the right machine than for you to have what you think is the best vault. If his machines fail to get out production at the most economical rate, his costs go up and he cannot meet competition."

"But isn't it a good machine this firm wants you to buy, if it buys your drilling machine, Mr. Brownell?" asked Mr. Clayton.

"Fine machine, Mr. Clayton, but not so well adapted to my work as some others."

"And there's also a chance that your machine isn't exactly what the other fellow needs," remarked Mr. Holland. "I've known a number of cases where men seem to be obsessed with this idea of swapping machines. Seem to feel they are getting machinery for less money if they can swap for it."

"But doesn't it stimulate trade, Mr. Holland?"

"It might be a good thing if each machine was the best for the other fellow. But it seldom is. I've heard of instances where machines bought by an automobile manufacturer were influenced by the car the builders of the machine drove. And then he wanted a special price on the machine even though he never shaded the price of the car.

"It's a bad practice, Mr. Clayton, and leads to all sorts of complications. Every shop manager should select the machine equipment best suited to his work. If he must take whatever machine the sales department dumps on him because it was secured in trade, he is very apt to be sadly handicapped.

"If there is no choice between two machines, he will not mind playing with the sales department swapper. But it's a bad habit to get into and is pretty sure to lead to biased judgment. Making orders contingent on a swapping of machines is a poor way to equip a factory for best results."

Liability for Injury to Trainmen Working on Plant Tracks

By Leslie Childs

THE operation of an industrial plant of any considerable size usually implies the use of a certain amount of trackage, in its connection with a carrier. Such trackage may or may not be under the exclusive control of the carrier, but the switching thereon will usually be done by the carrier for the convenience of, and upon the orders of the plant served.

The question then arises as to the liability of an industrial plant for injury to trainmen engaged in switching under its orders. And, while of course the subject cannot be covered by a hard and fast rule, because each case of this kind must necessarily be decided in the light of its facts, yet this much may be said.

Where cars are placed upon industrial tracks the plant served is bound to handle them with an eye to the safety of train crews that may be called upon to move them. And, if a trainman suffers injury through the negligence of the plant in this respect, liability may follow. The application of this rule is illustrated in the Wisconsin case of O'Connor v. Pawling & Harnischfeger Co., 210 N.W. 696, which arose under the following facts:

In this case the plaintiff was a trainman in the employ of a railroad company which served the Pawling & Harnischfeger Co. through the medium of a spur track. While plaintiff was switching cars upon the above track he was seriously injured by a timber falling from a car upon him. He thereafter brought suit against both the railroad company, and the Pawling & Harnischfeger Co. for the injuries so suffered.

Upon the trial of the cause, the evidence tended to show that a gondola loaded with timbers had been placed upon the tracks of the Pawling & Harnischfeger Co. for its disposal; that certain employees of the latter had started to unload the car, and removed some of the side stakes for this purpose.

While the car was in this condition, the Pawling & Harnischfeger Co. directed the railroad company to take out a certain car of machinery. In order to do this it was necessary to first move the gondola loaded with timbers, and in doing this plaintiff suffered the injury complained of.

The evidence also tended to prove that the removal of the stakes from the gondola car rendered it unsafe to switch, and that the Pawling & Harnischfeger Co. did not give the train crew any warning of this condition, when it ordered the car of machinery taken out. And there was further proof that the unsafe condition of the timber loaded car was not so obvious that it would naturally attract the attention of the train crew to its condition.

Railroad Obtains Judgment

On the facts as they have been outlined above, the trial resulted in a judgment in favor of the railroad company, on motion sustained by the court. Judgment, however, was returned against the Pawling & Harnischfeger Co., which stood at $12,500. From this the latter company appealed to the higher court, and there in reviewing the record and in passing upon the sufficiency of the evidence to sustain the judgment the court, among other things, said:

"Plaintiff's injury was proximately caused by the conjunction of two acts, for both of which the Pawling & Harnischfeger Company was alone responsible: First, the company left the gondola car in such unsafe condition that timbers were liable to fall from it in the course of switching movements; and, second, the company thereafter gave switching orders which necessitated the movement of the car while it was in this unsafe condition. After the Pawling & Harnischfeger Company had put the load of the car in this unsafe condition, it was the duty of that company to warn the plaintiff of the unsafe condition of the car when it gave him orders which necessitated the movement of the car. * * *

"The proof sustains the finding of the jury that the failure of the Pawling & Harnischfeger Company to give warning of the unsafe condition of the gondola car was the proximate cause of the plaintiff's injuries. The proof also establishes the fact that the railway company was guilty of no want of ordinary care that proximately caused the injuries sustained by the plaintiff. * * *

"The evidence supports the finding of the jury that the unsafe condition of the car was not so obvious as to naturally attract plaintiff's attention. The plaintiff had a right to rely upon the practice by which industries placed some kind of signal or card upon cars that were not to be moved.

Had Previously Warned

"Plaintiff knew that the employees of the Pawling & Harnischfeger Company who gave directions as to the movement of cars within its plant had in the past reported to him the cars on the tracks in the plant which were not safe to be moved. Knowledge of these facts, coupled with the absence of all warning, together with the finding of fact by the jury that the unsafe condition was not so obvious as naturally to attract attention, leads to the conclusion that the plaintiff was not guilty of contributary negligence in not discovering the unsafe condition of the load on the car before he was injured. * * *"

In conclusion, after passing upon other facts not material here, the court affirmed the judgment of the trial court in favor of the plaintiff. Holding, in line with the foregoing language, that the record amply supported the judgment of the trial court holding the Pawling & Harnischfeger Company liable for plaintiff's injuries.

In the light of the facts and circumstances of the foregoing case, it is believed the holding of the court is in accord with the general rule of liability in situations of this kind. This rule holds that an industrial concern is bound to order switching operations within its plant, with a view to protecting train crews from danger which it has created in the handling of rolling stock.

It follows, that negligent acts on the part of a plant's employees, that result in injury to a member of a switching crew, may fasten liability upon the employer. The case reviewed constitutes a worthwhile illustration of the application of this rule, and suggests the importance of care in this phase of industrial management, if the danger from serious liability is to be guarded against.

Roughing Lancia Sleeves

By J. A. Lucas

Construction of the cylinder block involves preparing the sleeves to be cast in place with surfaces machined to be accurately located in the metal mold

IN ORDER to accurately locate the cast-iron sleeves in the aluminum cylinder-block by which they are surrounded, it is necessary to machine portions at each end with sufficient accuracy to enable them to be easily held in their proper position in the permanent mold. The sleeves are of a special mixture of iron containing a small percentage of nickel. The object is to secure not only a fine-grained iron of sufficient strength, but also to bring the coefficient of expansion as near as possible to that of the aluminum in which the sleeves are cast. The sleeve castings are very carefully inspected to detect blowholes, and all of them are tested for porosity. Two per cent of all castings are broken in small pieces, and the pieces are tested at random by the metallurgist to see how well the different ingredients are distributed. Tests are also made to check the strength of the sleeves in various places. The first machining operation is to rough bore the sleeves on the two-spindle machine shown in Fig. 1. The sleeves are held against four setscrews in the back of the fixture by the swinging clamp *A*, which grips the casting near each end. The type of boring tool can be seen at *B*. Each bar is guided by a sleeve *C* that fits into a substantial bushing held in the upper end of the boring fixture. The setscrews at the back allow for any centralizing adjustment that may be necessary, the double clamps holding the sleeves firmly in place. The ends of the sleeves rest on the crossbar *D* as an aid in taking the end thrust. An opening through the bottom of the fixture permits the tools and the chips to pass through freely. Particular attention is paid to the bores at the lower ends of the sleeves, which receive a second operation in order to secure a standard diameter within quite close limits. This second operation is done so that the lower ends of the sleeves can be accurately located in the permanent mold before casting the aluminum cylinder-block around them. The sleeves are bored to 75 mm. diameter, and the time is 6 min. each, floor to floor.

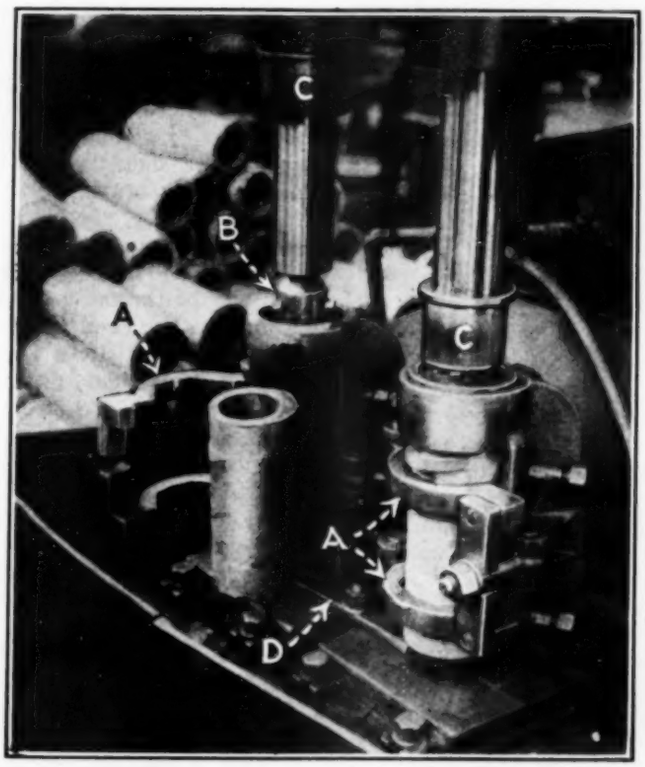
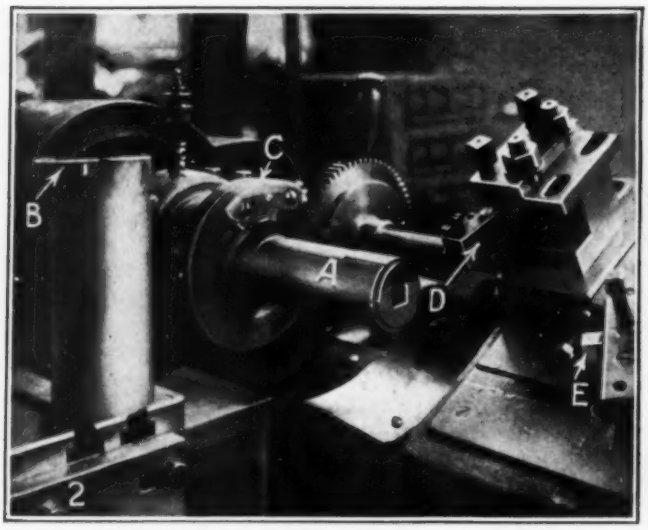


Fig. 1—Boring the cast-iron sleeve in simple and easily handled fixtures. Inserted, staggered-tooth cutters are used, the spindle being guided by removable steel bushings

Following the boring is the outside turning on a Gridley machine, as in Fig. 2. Here the sleeves are held on the expanding mandrel *A* and are driven by the projecting lug *B* on their upper ends contacting with the driver *C*. On account of the angularity of the upper faces of the sleeves, owing to their being set 7½ deg. out of perpendicular in the cylinder block, the chuck that holds them has a surface at a corresponding angle. The sleeves are turned by the tool *D* and are faced by another tool at *E*. The inclined faces of the sleeves carry two V-shaped projections by which they are centered and firmly held in the upper end of the permanent mold. This surface is machined in the milling fixture shown in Fig. 3, on a No. 4 Cincinnati machine, using a pair of helical cutters that are formed so as to leave V-shaped lugs in the centers of the sleeves, as can be seen at *A*. The sleeves are held at an angle in the fixture and it will be noted that they are mated up in pairs with the lugs facing



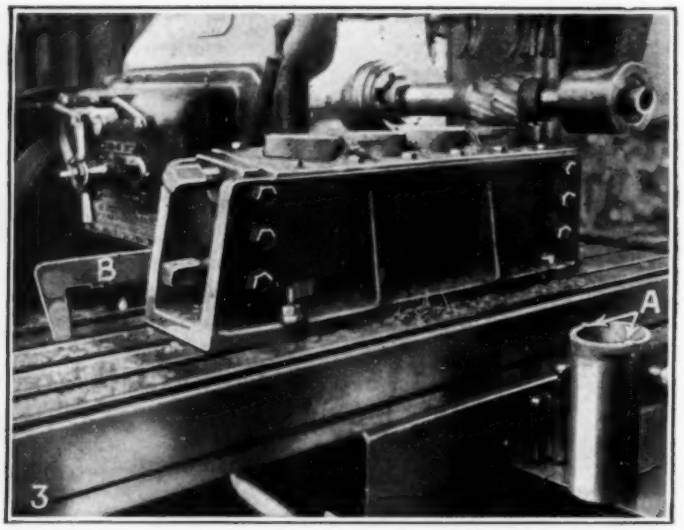


Fig. 2—Turning the outside of a sleeve on a Gridley lathe, using an expanding mandrel for centering, and driving by the projecting lug next to the lathe spindle. Fig. 3—Milling the ends of a set of cylinder sleeves. The sleeves are positioned alternately, and the cutters are so formed as to leave V-shaped lugs on each angular face

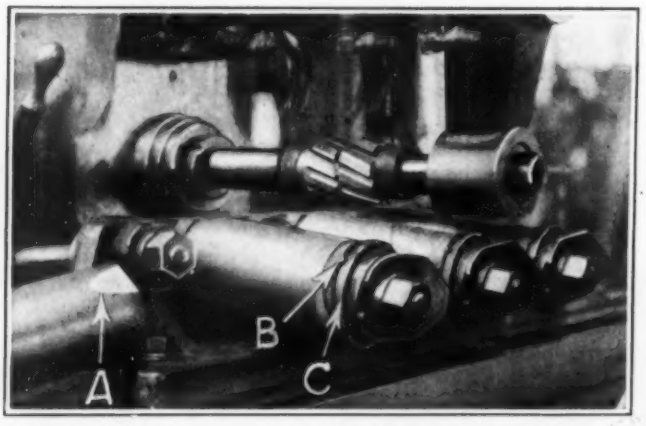


Fig. 4—Milling an angular clearing space at bottom of sleeve. Sleeves are held by the V-shaped lugs located by suitable collars at the end of the holding bolts, or studs

each other. In this way the upper surfaces are milled at opposite angles on the two sleeves, so that when assembled in the mold all four sleeves will present a flat surface on top of the mold. A gage for checking the length of the sleeves is partially shown at *B*.

Another milling operation is shown in Fig. 4, where one side of the lower end of each sleeve has a cut taken at the proper angle to allow a greater thickness of aluminum where its end approaches the end of the next one at the bottom of the crankcase. The angular position at which these cuts *A*, are milled can be seen by noting the position of the V-shaped lugs as at *B*. The location is determined by the washers as at *C*, having grooves across their faces corresponding to the V-shaped lugs on the sleeves, and being keyed to the large bolts, or studs, so that they can slide, but not turn. Here again the sleeves are set alternately with regard to the cams, or lugs, at the ends, so that the flat surfaces milled will be in their proper position when the sleeves are set in the mold.

This is one of the many ingenious methods worked out by the designers and production men to insure a better product, with less likelihood of rejections. Although these methods apply only to the design shown they are suggestive of ideas that can be modified to suit conditions that may arise in other plants.

The machining time is 2 min. per sleeve, after which the sleeves are sandblasted and copper plated to assist in securing good contact when the aluminum is poured.

The Cost of Noise

IT IS the fashion to regard the factory as a "hive of industry," where the busy hum is provided by the rattle, clatter and bang of machines, with the accompaniment of chains, gears and belts. The opinion has grown that industry and noise are inseparable, and, to a certain extent, this is true.

Theoretically, the perfect machine will be perfectly silent, and will allow of no loss of energy to cause noise vibrations. The more efficient a machine becomes, the less will be the noise thrown out by it during working.

Perhaps the chief cause of breakage of machine parts is the repeated stress from vibrations. Each vibration that causes sound also causes molecular disturbance, which weakens the structure. Thus, by reducing the number of vibrations, the life of a machine part is lengthened.

The physical aspect of the question is, however, far more important. The particular part about noise is that one becomes accustomed to it, but in spite of this fact, the bad effects are thereby not eliminated. On the contrary, it is the constantly recurring monotonous noises that have the worst results. The throbbing of a compressor may become so much a part of a workman's existence that he is not conscious of it being there, yet it is hammering away at the brain and causing a numbness of the senses.

One of the best means of stamping out the vibrations of a machine is to mount the whole upon a pad of rubber, cloth or felt, or on some of the compound materials that are on the market for the purpose.

Details of Jigs and Fixtures

Design of Push Pins and Plugs

By J. A. POTTER

Locating work in jigs and fixtures depends upon the choice of the cuts taken first—Push pins and plugs as locators, supports, and clamps

IT IS hard to set a fixed rule as to whether parts are to be milled first, and the work located from finished surfaces for the drilling operations, or whether it is better to manufacture the parts by drilling first and then locating them on push pins or plugs for the milling operations. Of course the main idea is to group machines of a similar class so that there will be less interdepartmental transportation, but the shape and size of a part will often determine whether it is to be started in the drilling or milling department for the first operation. Push pins and plugs can be made to support, locate, and bind the work in position. When used as a support, the work is usually located and clamped in position, the pin then being brought up to a surface on the work and locked. If properly operated and locked, the push pin or a spring pin will support the work against the thrust of milling, drilling or counterboring, without springing the part on which operations are performed. All of the pins illustrated are shown with a bar through the handle, as at *A*, Fig. 1, but can be made with a knurl as shown at *B*, if desired. A knurled knob, or pin, when covered with oil and chips or cast-iron dust will make an operator's fingers very tender if the fixture or jig is to be used for a number of parts. If the knurled handle is to be used, a hole should be drilled through it, for the reason that a jig or fixture, after being stored, will often be found with the pins frozen in, or hard to remove. A pin or file end can be inserted in the hole, and the push plug easily started.

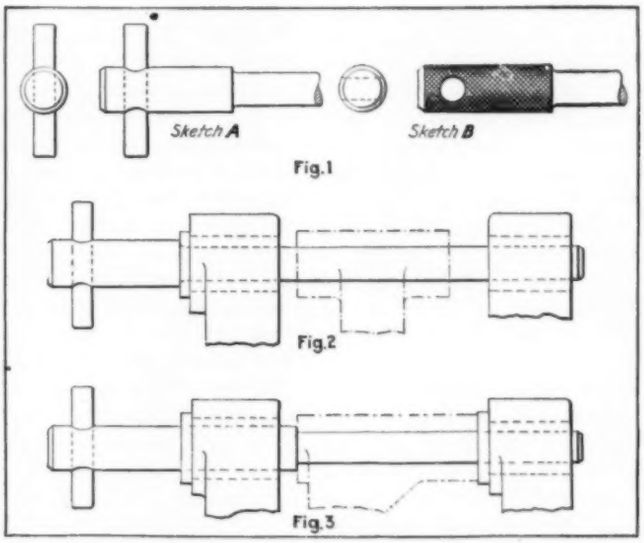


Fig. 1-3—Simple types of push pins

The plain pin, as shown in Fig. 2, will simply support work. This pin is shouldered to form a stop on the outside bushing. All plugs or pins should have some means of stopping, so that the handle will extend a sufficient distance beyond the wall of the jig or fixture. An operator can then get his fingers under the cross pin without barking his knuckles. Another point is to avoid making the cross pin too small in diameter, as larger pins can be handled much better by the operator without fatigue of the fingers.

In Fig. 3 is illustrated a shoulder pin with the shoulder resting against the part. The part in turn is resting against a shoulder bushing which also supports the pin. This pin will support and locate the part by pushing the work against the bushing, after which it may be locked in place by a setscrew or pinch-lug. Parts are sometimes located on two plugs, in which case one of the plugs should be elongated or oval shaped. To meet a condition like this, the elongated pin should have a fixed position in relation with the other plug. The plug is made with two shoulders, one of which will rest against the work, and the other is slabbed off so that the flat can take a relation with a hardened-steel block and position the elongated portion to work in proper relation with the other pin. This is shown in Fig. 4. A clearance of $\frac{1}{32}$ in. should be allowed at *A*, so that the handle can be rocked to start the pin out easily.

A plug can be made to fit two concentric holes, but unless it is necessary, it is better to choose the deeper hole and clear the other to give alignment as shown in Fig. 5. If, however, a heavy machining operation is to be performed over the shorter hole, it is well to support at that point with the plug, and have the plug supporting bushing as near to the work as possible. In Fig. 6 this is illustrated.

If a part is to have a keyway in addition to the hole, the plug can be made to utilize the keyway to position as well as to support the work. At Fig. 7 is shown a key on a plug, which can be screwed or doweled in. The plug is passed through a thick-walled bushing with a slot cut through it to clear the key. The flange is slabbed off in a similar manner to the plug shown in Fig. 4, but the locating block in this case rests against the pin to square it up. The plug in such a case could not be rocked to

The eighth article. The ninth will appear in an early issue.

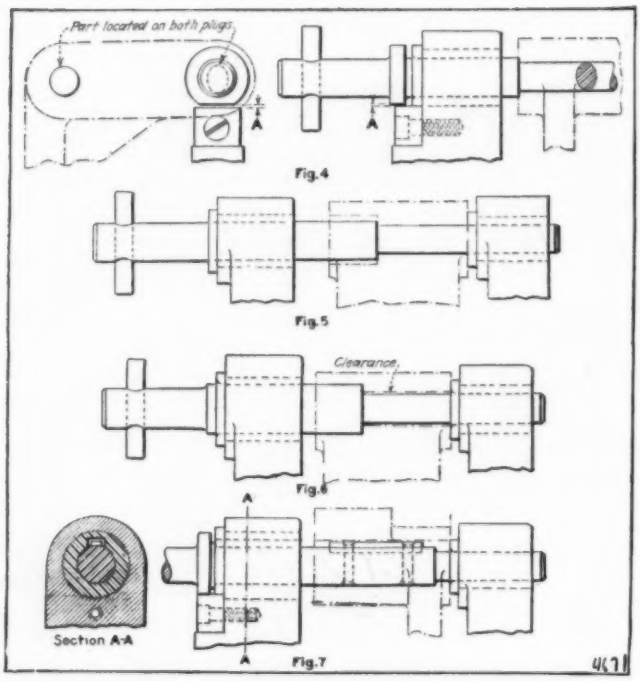


Fig. 4—Push pin for 2-hole location. Figs. 5-6—Locating the part on one bearing only. Fig. 7—Push plug with a locating pin

start it out, so the under side of the flange has an additional step to provide for a screw driver to be inserted between the head of the bushing and the pin to start out the plug.

A pin can be made to support, push, and bind a part as illustrated in Fig. 8, in which the plug supports the work as outlined, pushes it over against the head of the bushing *A*, through the shoulder *B*, and binds it in position with the cam on flange. The flange in this case is slabbed off to clear the offset block *C*, and a helix is turned on the back of the flange. This plug will be found quick and positive in action. The binding force can be increased by reducing the angle on the helix to suit the conditions under which it is to be used.

On heavy work, it is sometimes of advantage to locate the work on one plug only, and then swing it into position, rather than to attempt to place the work over the two plugs. The second plug can be pushed through a bushing from the back to locate in the hole. If it were desired to lock the part in place, the pin can be dogged on the back, after which a nut can be run down on the threaded end and tightened. This is naturally a slow operation, but if the hole in the part is large enough, a cap screw can be set in the end of the plug. The plug with the cap screw can then be passed through the hole, and a split washer or collar slipped under the cap-screw head, which will hold the part in place, after the screw has been given one or two turns. The illustration in Fig. 9 shows the method with a split washer.

Both of the methods described in the preceding paragraph are rather slow, in that a wrench has to be picked up to tighten the nut or cap screw. A much faster way to make the plug is illustrated in Fig. 10. This plug can be inserted in the work, and the work can then be pushed around to pick up the bushing. The end of the plug at *E* is tapered to pick up the hole in the bushing. This same end has two flats cut on opposite sides. After the plug has passed through both the part and the bushing, this end will protrude, and the latch *B* can be swung over the flats and keep the plug from being pulled out on the other side, and also keep it from turning when the handle *C* is tightened against the work. This type of plug can also be used with a double bushing support by having the handle *C* ground on the shank at *D* to the size of the supporting bushing, in which case it will bind the work.

A plug similar to the one shown in Fig. 10 is illustrated in Fig. 11. The difference is that this plug is operated from the back and tightened from the front, whereas the one shown in Fig. 10 is operated from the front and tightened from the front. The plug is also shown supported in two bushings, the outer bushing sliding through a lining bushing and being used to bind the work against the shoulder bushing. This plug is shown with a split collar, although a latch, as in Fig. 10, can be used to advantage. Cheapness recommends the split washer, but it is easily lost or misplaced.

A threaded plug supported in bushings is shown in Fig. 12. The plug takes its alignment from the bushings, and the thread is made a free fit. The threads should be made with a coarse pitch to enable the plug to be operated rapidly, but a finer pitch can be used to increase the binding pressure. If the fine pitch is used, extra strength should be added to the walls of the jig, so that they will stand under the extra pressure. The threaded bushing has the head reversed, so that the bushing will not be forced out of position when the plug is tightened.

A cheap plug that binds and locates is illustrated in Fig. 13. This plug has a bar in the handle, which engages a hardened steel block. The block has an internal inclined surface of about 5 deg. The plug is inserted and given a right-hand turn, the bar engaging the inclined plane and binding the plug in position.

Push pins are usually pushed into place with the index or middle finger. Therefore, a head is usually provided as shown at *A*, Fig. 14. This pin can either be turned down to form a head, or a separate piece can be driven on as illustrated. Some push pins are made straight with a small cross pin to keep the push pin from passing too far into the bushing. This is shown at *B*, Fig. 14. Other push pins may have a pin driven into the shank, the pin sliding into a slot, as at *C*, to keep the push pin in a fixed relation to the part.

A push pin can be set at an angle to support the work when it is not convenient to make a direct support. This is illustrated in Fig. 15. If this method is necessary,

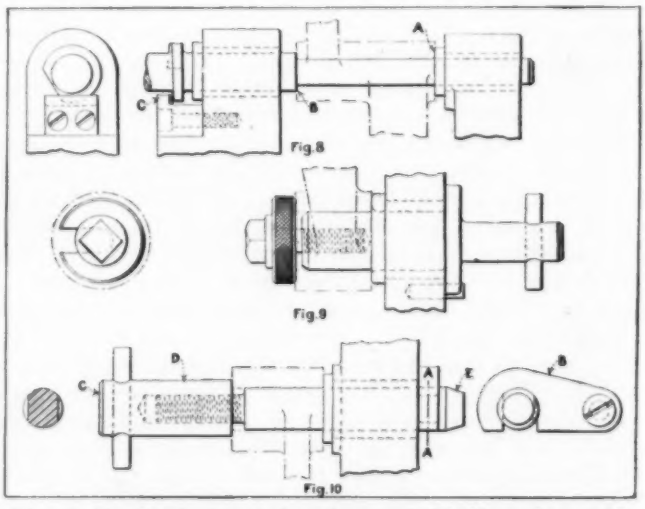
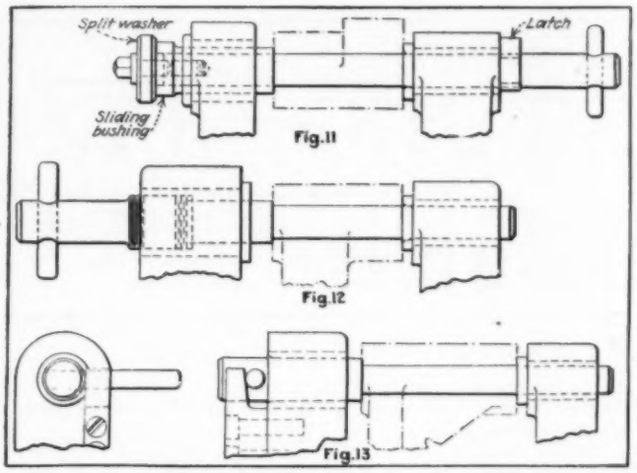


Fig. 8-10—Methods of locating and binding the work with push pins



Figs. 11-13—Other examples of locating and binding the work

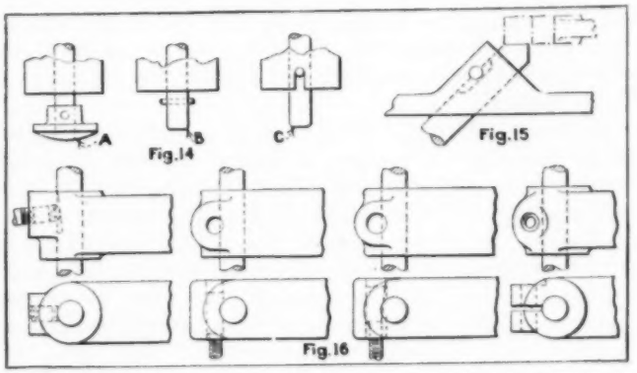


Fig. 14—Heads and ends of push pins. Fig. 15—Push pin acting as a work support. Fig. 16—Various methods of binding push pins

the push pin diameter is made larger than for ordinary practice, and has the supporting bearing as near to the work as possible, due to the end of the pin being in shear. A flat is provided on the shank of the pin, and a small cross pin is used to keep the push pin from turning, so that the nose end will always present the flat surface to the work.

All of the plugs shown without locking devices can be held in position by the same methods as are used on spring pins, which were described in a previous article. A few binding devices are illustrated in Fig. 16, any one of which can be adapted to holding a plug in position by the use of a nut and wrench, wing nut, screw, or by means of a cam for quick operating. Care should be taken in using a binding plug, that the act of tightening does not throw the plug out of alignment. A careful consideration should be given to parts that are adaptable to plug suspension. A part having a large span might be suitable for light drilling operations, but would not stand the force necessary for a counterboring operation. On the other hand, a shorter span with a larger plug would be capable of standing the shock of a broad formed cutter and permit a cut free from chatter marks. Very small parts are not usually supported on plugs, due to the correspondingly small diameter holes, but even some of these can use plugs to advantage on light operations such as grinding or polishing.

In any case judgment, based on long experience, is of great value in determining the best method to be used. Each factor involved should be carefully considered.

Isometric Drawings and Ellipse Templates

By Henry Simon

IT IS a strange fact, but a fact nevertheless, that the more extended use of a whole branch of the draftsman's art is prevented by just one circumstance—the difficulty of drawing the circle in perspective. Yet that is exactly what is true of isometric drawing, which is a method of representing objects in a highly realistic way. It is essentially as simple and for many purposes would be as easy as orthographic projection, if it were not for the large amount of trouble and time required to draw those portions that appear as circles in the orthographic drawing. Such a simple object as the shouldered piece shown in Fig. 1, with ten ellipses required to be produced by construction, is beyond the pale of routine work.

Yet such a piece, and in fact a great deal of work of a much more complicated nature, can be produced as rapidly as any orthographic three-view drawing, if templates of the proper design are on hand. The idea that the isometric is in itself more complicated and difficult is largely a prejudice arising out of the unfamiliarity of the average draftsman with this branch of the art. That the essential difference is not great may be seen from Fig. 2. By counting the lines required to be drawn to represent the block shown at *A*, it will be seen that they are exactly the same in number, and as the 30-deg. angle remains fixed, it will be clear that there is practically no difference in the time or effort required to draw the part either way.

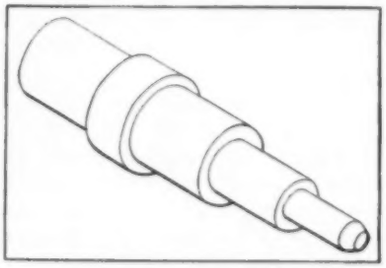


Fig. 1—Representation of a shouldered piece necessitates ten isometric ellipses

The same condition prevails in regard to the screw shown at *B*. Given an instrument for producing the elliptical sections as rapidly as the circle can be drawn with a compass, then no more effort will be required to produce the isometric view. Even the more detailed view

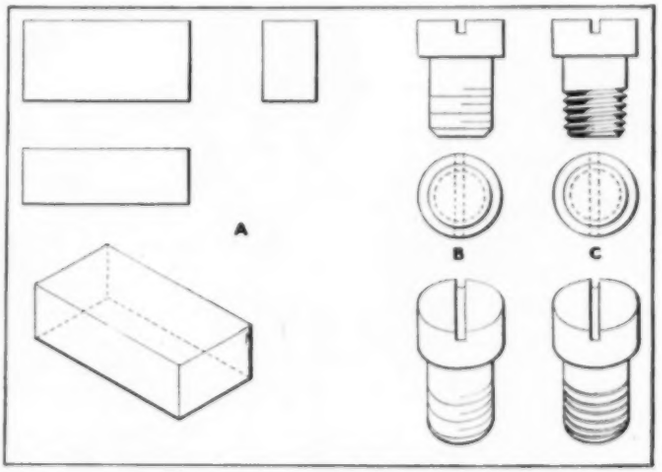


Fig. 2—Comparison of the number of lines required to draw an object in three views and in isometric

of the same part at *C* shows a decided gain in time over the orthographic method, though it is true that the thread angle cannot be seen. It is also true that the representation of the thread is not altogether correct—but neither is it in the more laborious orthographic view. It would plainly be useless to argue the relative merits of the perspective against the projection method. But it is possible to argue with a great deal of force for the more extensive use of the perspective as a complement to orthographic projection, especially in the design of special tools and mechanisms. Many a mistake could be prevented, many an unhandy or clumsy feature avoided, and many a piece saved from the scrap pile, if an isometric drawing had been made of it before work on it was begun. One particular advantage of the perspective is its ability to reveal the overlooked things, and an advantage just as great is that the man in the shop is much better able to judge and criticize such a drawing. So long as tools are designed, it will always be cheaper to make mistakes on paper rather than in steel and bronze.

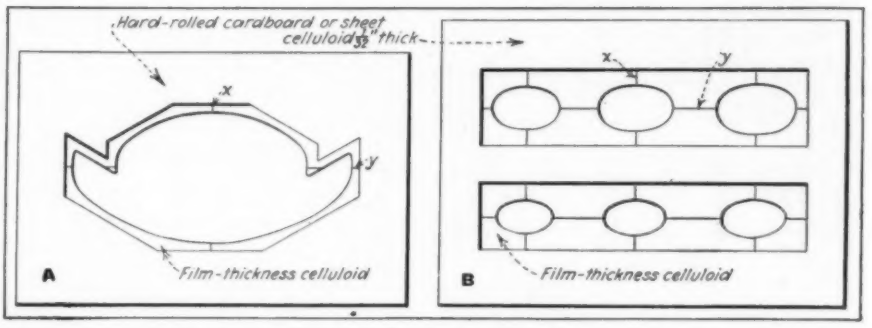


Fig. 3—Construction of a set of ellipse templates

It is unfortunate that the restricted sets of ellipses that are on the market are not able to offer much encouragement. Such ellipse forms as exist are of the male shape, which is rather troublesome to use, both because the pen or pencil have a tendency to slip outward and away from template, and because there is no provision for the numerous small ellipses needed.

It is next to impossible, unless special equipment, such as a pantograph machine is on hand, to produce a satisfactory set of such templates out of the $\frac{1}{32}$-in. thick celluloid which draftsmen commonly use for similar purposes. In Fig. 3, however, there is shown a way in which any draftsman can make himself a complete set of accurate isometric ellipse templates at the expenditure of only a few hours' time and very little other expense.

In this form, the template proper is cut from sheet celluloid of the thickness of ordinary photographic film, and this is cemented to a hard-rolled cardboard or celluloid frame in which a proper opening has been cut out. The writer has a set of about thirty ellipses made in this way which are accommodated in ten templates and which range from an overall length of $\frac{1}{4}$ in. to 4 in. They enable him to handle almost anything that comes along and do a quick and neat job.

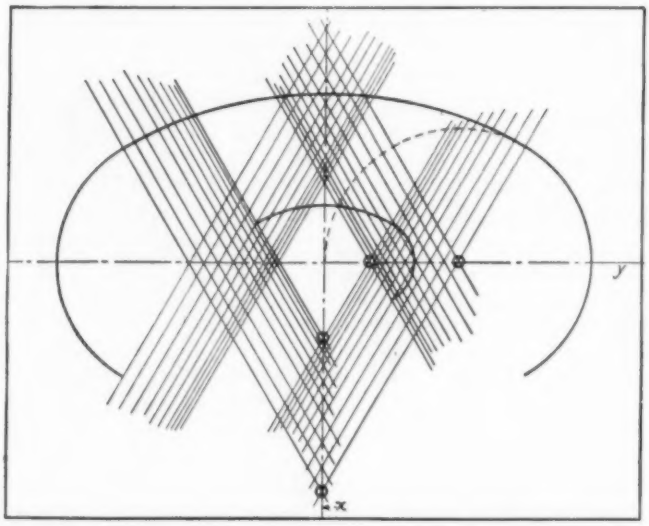


Fig. 4—Layout of a series of conventional ellipses

Ellipses from $\frac{1}{4}$ to $1\frac{1}{2}$ in. in length are accommodated in groups in frames of the type shown at *B*. For the larger shapes, two half-ellipses differing about an inch in length are paired together as seen at *A*. The particular small-shape template shown at *B* has the regular type of conventional ellipse, while the one at *A* shows the improved construction described by the writer in a former article.

It is not difficult to make templates of this kind, provided the right procedure is followed. The first step should be to decide on the sizes to be used, and to draw a framework for these sizes on bristol board, as shown in Fig. 4. It will be seen that the regular circumscribed ellipse construction is not used here, the parallelograms connecting the foci only being drawn. The illustration gives some idea of the manner of "stepping" the various ellipses, and it should be remembered that upon this drawing, the accuracy of the finished template absolutely depends. The drawing must therefore be laid out with great care and drawn with a very hard and sharp pencil. The use of a magnifying glass in laying out the dimensions is advisable in this work, and is quite indispensable in the subsequent operations.

A piece of celluloid is next tacked over this drawing, and the lines *x* and *y* scratched very lightly in with the point of a divider. It is essential that the dividers used for the job be carefully sharpened to a slender and exceedingly fine point, as otherwise the result will be unsatisfactory. It is also necessary that the scratched center lines exactly overlie the corresponding lines of the drawing, as they must serve to locate the stationary point of the divider. The outline is next scratched in, and it will be noted that in the example given, which shows the ordinary conventional form, the radius of the small circle is equal to the distance of the focus from the intersection of the lines *x* and *y*. Great care must be taken to match the ends of the arcs where they meet.

When the shape is finished, the hairlines are brought out by rubbing lamp black into them, and the piece is ready to cement to the frame. A compound of acetone with celluloid is best for this purpose, both pieces being coated and kept under a light pressure for half a day. When dry, the frames are carefully lined up on the drawing board, and the edges trimmed exactly parallel with the center lines *x* and *y*, so that the template may be used in connection with a T-square or triangle in any position.

For pencil work, the templates are used with the film side on the paper. When inking-in, the template is reversed, the frame holding the shape away from the paper by the right amount to allow the use of the tubular pen.

Quantity Production with Standard Tools

By M. E. LANGE
Production Engineer, The Warner & Swasey Company

THE problem of the quantity producer is to increase production to the maximum with the least possible tool cost. In the short time usually available the turret lathe must be tooled to give maximum output. On the other hand, tooling costs must be carefully considered if the true cost per piece of the quantity manufacturer is to be kept low.

This naturally raises the vitally important question of the selection of standard or special tools. The use of standard tools obtainable from the manufacturer, quickly and at a known cost, offers admitted advantages, but the tool designer must be sure that the production of the standard tool will actually handle the particular work without tool interferences. If standard tools can be used, not only will the first cost be reduced, but the tools may be used again and again for later jobs, thus still further reducing the tool cost per piece of the work in hand.

The first of two articles. The second will appear in an early issue.

This suggests a careful study of the possibilities of standard tools for different types of work, which may perhaps be done best by a consideration of four well-known operations:

1. Turning—chucking work and bar work.
2. Boring and recessing.
3. Facing.
4. Irregular contour work.

TURNING—CHUCKING WORK

In considering the possibilities of standard tools for turning, let us first examine the tools used for chucking work and then follow this examination with a discussion of bar tools.

In order to take advantage of the principle of combined cuts on chucking work, that is, the possibility of taking turning cuts from the hexagon turret and facing cuts from the cross-slide at the same time, it is necessary to mount the tools on the hexagon turret in order to insure clearing the cross-slide

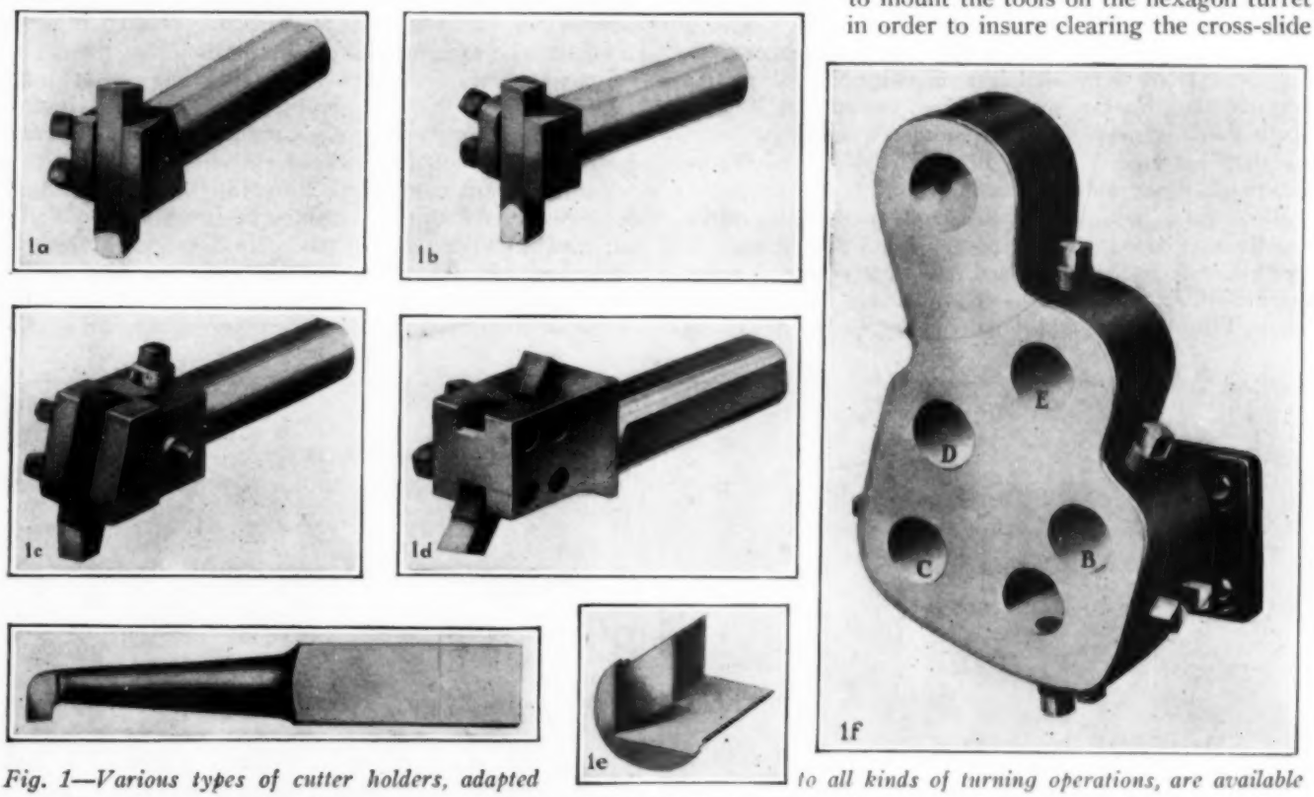
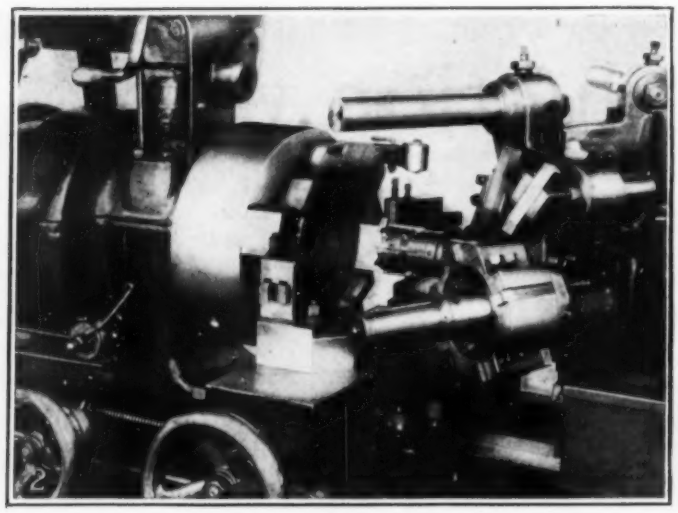
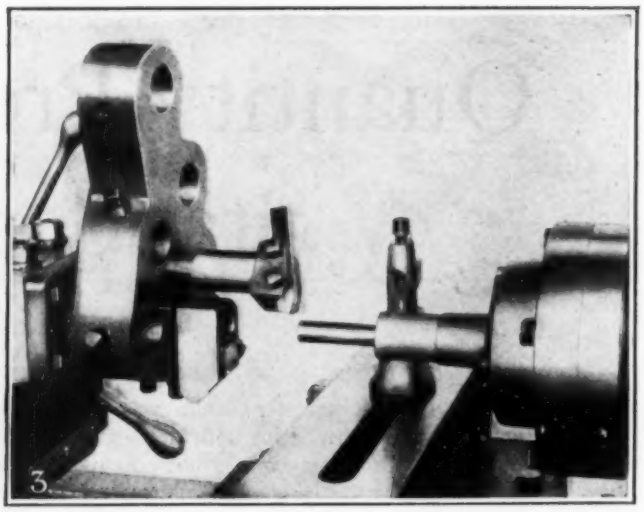


Fig. 1—Various types of cutter holders, adapted to all kinds of turning operations, are available

1a—The angle cutter-holder allows close turning to a shoulder or to the chuck jaws. 1b—The straight cutter-holder is used for all ordinary turning, facing and boring operations. 1c—The adjustable-angle cutter holder can be accurately set and reset to within 0.001 in. by means of a graduated collar on the adjusting screw. 1d—On certain types of work, the offset cutter-holder gives a better support to the cutter by reducing its overhang. 1e—Used with forged boring cutters, such as the one shown at the left, this bushing gives very accurate adjustment due to its rocking points. 1f—Five holes, *B*, *C*, *D*, *E* and the center hole, are provided in the multiple turning head to hold the various cutter holders





Figs. 2 and 3—Examples showing the use of the multiple turning head

Great sturdiness together with the least overall dimensions is evident. An overhead pilot bar can be added to the standard tool whenever heavy-duty work is encountered. The valuable feature of this method of obtaining added rigidity, lies in the adjustability of the standard bar and its bushing, permitting accurate alignment to be quickly established

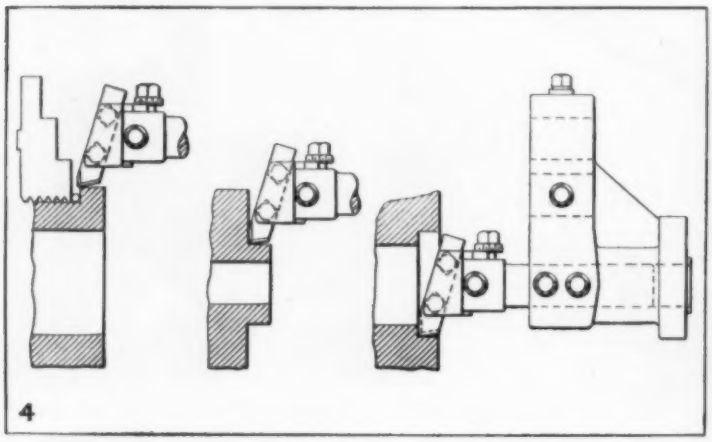
tools. The standard multiple-turning head, Fig. 1, can be employed in practically every instance where the old-fashioned, special, knee turning tool formerly was specified. The cutters, held in the angle cutter-holders, are supported rigidly, and these modern tools will produce work at least as rapidly as the older and special ones.

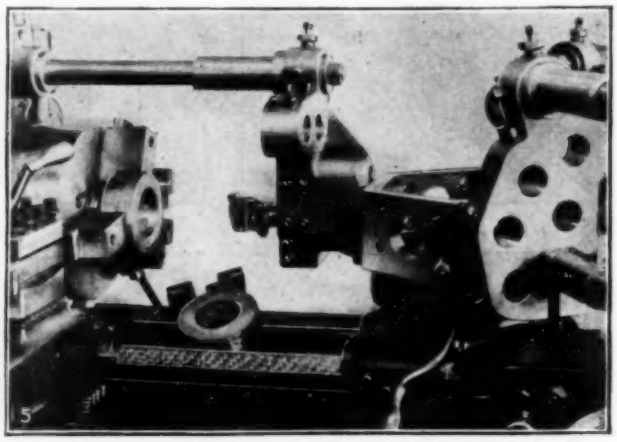
Rigidity Without Interference

The advantage in using a standard tool of this sort, lies in the fact that a great amount of thought has been spent to secure the greatest possible rigidity without interference from adjacent tools. Such refinement cannot be carried to a like extreme with special tooling, because the time is not available, nor is the expense justifiable for perfecting one single, special-tool design to that extreme. Using Figs. 2 and 3 as further examples of the multiple turning head, there is not only evident great sturdiness with least overall dimensions, but there is shown also the possibility of adding an overhead pilot-bar to the standard tool at any time if heavy-duty work is encountered. The valuable feature of this method of obtaining additional rigidity, lies in the adjustability of this standard bar and its bushing so that accurate alignment can be quickly established at any time between the bar, the bushing and the ways of the machine. Thus, rigidity has been obtained without any special machine work, and hence maximum feeds are assured without sacrificing the accuracy of the work.

Secondly, standard tools have built into them, wherever possible, the feature of fine adjustment, which is valuable when setting cutters to close size after grinding, thus reducing the "set-up time." In the case of turning heads, for instance, an adjustable-angle cutter holder, Figs. 4 and 5, can be mounted in any of the holes of the head. This tool has a micrometer adjusting screw and is sufficiently rigid so that the graduations can be depended upon for setting the cutter accurately to remove a predetermined amount of stock.

Referring again to Figs. 2 and 3, these illustrations show clearly the third advantage of great range of the standard multiple turning-head. In the one instance a workpiece of approximately eleven inches has to be turned and faced, requiring great rigidity to absorb the torque of the broad, flat facing cutters, which are work-





Figs. 4 and 5—Adjustable-angle cutter holder mounted in multiple turning head

The cutter holder can be mounted in any one of the holes in the head, as shown by the different positions in relation to the line of centers in Fig. 4. This tool is provided with a micrometer adjusting screw and is sufficiently rigid so that the graduations can be depended upon for setting the cutter so that it will size the work accurately

ing at the same time that the turning cutters are in operation. In the other view is shown a comparatively light job with a 1½ in. diameter. These two applications show the universal quality of a standard tool, which keeps the tool cost down over a period of years by making possible the use of the standard tool over and over again, as the product changes in design. The fourth feature in favor of the use of standard tooling is the possibility of using the standard tool as a base upon which special attachments can be mounted that will render the tool more useful for highly single-purpose conditions. Referring again to Figs. 2 and 3, we find in Fig. 2 a special facing head with revolving pilot, which is securely fastened to the front of the turning head, while the turning cutters are held above in standard, interchangeable holders. In Fig. 3 a pilot bushing and facing head, combined, are mounted in the center hole, in which is guided the pilot extension of the work arbor. In case of changes of design of the product, these special attachments probably will have to be scrapped, but the standard tools can be used until worn out.

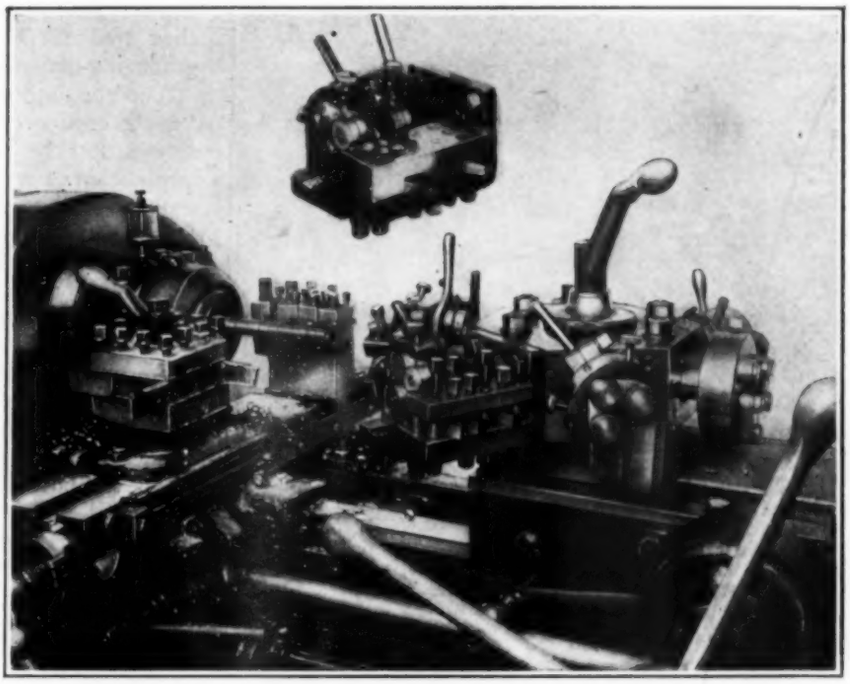


Fig. 6—Multiple-cutter turner on the hexagon turret

For quantity production this tool can be modified by substituting for the standard cutter clamping block, a special block having locating slots for the cutters, as shown in the inset. The cutters can be relocated accurately after grinding

The performance of standard turret tools for bar work is generally recognized as being so satisfactory that it is scarcely necessary to mention here that special tools are being substituted for standard in rare instances only. Standard roller-rest tools, for example, are almost universally used from the hexagon turret, and forged cutters are mounted in the square turret, thus combining two cuts at one time.

When it is possible to turn more than one diameter at one time with a hexagon turret tool, a multiple-cutter turner, such as shown in Fig. 6, can be used to advantage.

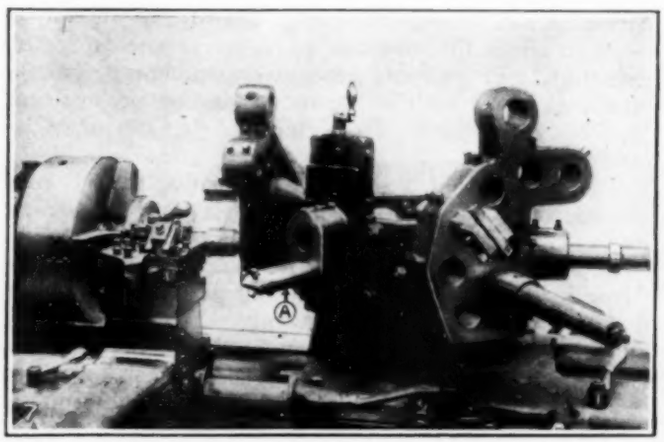
For quantity-production work this tool can be modified by substituting for the standard cutter-clamping block, a special block with locating slots for the cutters, as is shown in the inset in Fig. 6. This block reduces the "set-up time" when setting cutters after grinding, because the slots permit the cutters to be relocated accurately.

We have here an example of the possibility of using a standard tool as a base, and mounting thereon any special device that will make the tool more productive for quantity work. This particular tool combination will produce as much work as an entirely special tool, and there is the advantage of using the base over and over again with changes in the production program, making new, special cutter-holding blocks only. This is good practice.

Boring and Recessing

When planning tooling for boring operations, the work can be divided into two classes, first, heavy work that requires piloting; secondly, lighter work where there is sufficient rigidity without piloting.

For heavy work, the common practice is to employ bars



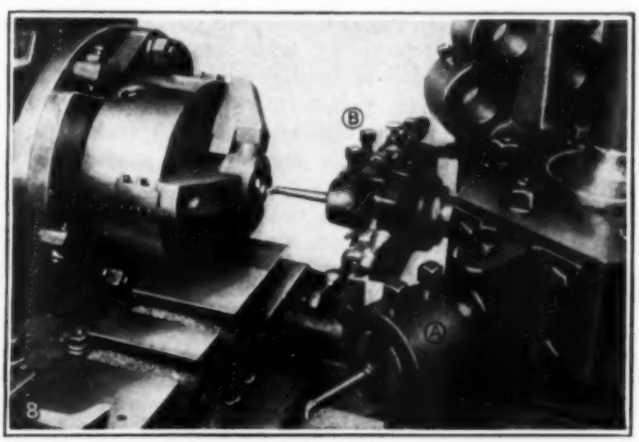


Fig. 7—Stub boring bar mounted in a slide tool. Fig. 8—Two methods of holding forged boring tools

Standard stub boring-bars are used when center piloting is not possible or necessary. Such a bar is held in the slide tool in Fig. 7 at *A*. A holder in which the cutter is clamped and adjusted by one locking and three adjusting screws is shown at *A* in Fig. 8. Where a more flexible adjustment is wanted, the tool can be held in the slide tool as shown at *B*

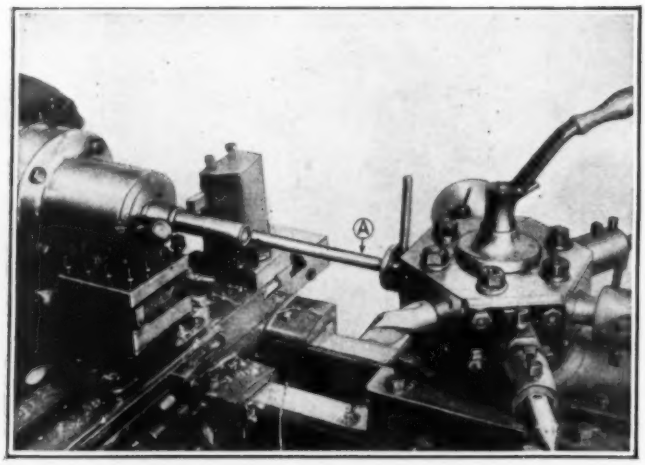


Fig. 9—A special tool for internal grooving

The tool to be seen at *A* is of use only for the job for which it was designed. The slide tool shown at *B* in the previous illustration, will do all that the special tool will do and has the advantage that it can be used for a variety of work

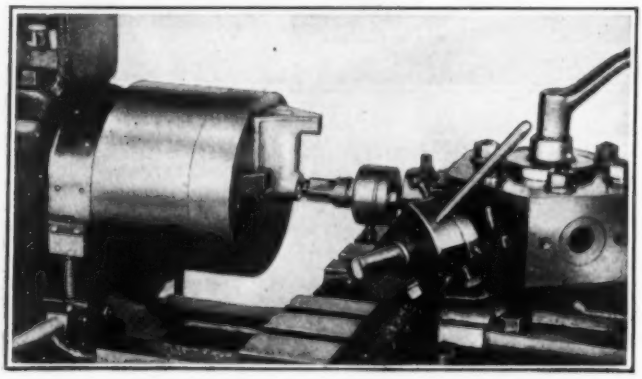


Fig. 10—A slide tool of the lever-feed type

In very light grooving, especially in the softer metals, this tool is very rapid. It has stops that can be set to lock the cutter, or to limit the motion within accurate limits

that have pilot extensions, Fig. 7, and in many cases these bars have to be made specially. There is no objection to doing this in quantity-production work, because such special bars can be used a sufficiently long time to pay for themselves. On chucking work, many cases are encountered where several heavy turning cuts are being taken from the same holder that the center pilot-bar is mounted in. When, as in this case, the center pilot-bar is heavy enough to support all these cuts, this method is perfectly satisfactory, but with smaller holes where the bar is weakened considerably by the cutter slot and is often barely strong enough to support its own cutter, this practice is not very commendable. In such a case, overhead piloting can easily be added at any time for additional support.

Where center piloting is not possible or necessary, standard stub boring-bars are available, and can be used for boring blind holes, recessing, etc. One such bar is held in the slide tool illustrated in Fig. 7 at *A*.

When rather deep holes of quite small diameter have to be bored, the inserted-cutter type of boring bar becomes too flimsy, and the forged boring cutter has to be resorted to in order to gain maximum strength. Several standard tools are available to hold such a cutter so that it can be adjusted easily. Fig. 8, at *A*, shows a holder in which the forged cutter is clamped and adjusted by the use of three adjusting screws and one locking screw. The advantage of this holder is its compactness. When a more flexible means for adjustment is desirable, the slide tool at *B* is preferable, because it has a large graduated-dial and adjustable stops.

The standard slide tool shown in Fig. 8 can be used for the cutting of grooves, recesses, etc., where the stop screws can be used to advantage to insure accurate duplication of work. The universal features of this slide tool are readily discernable, and they render it applicable to a great variety of work if the product should change.

In comparing this slide tool with the special tool at *A* in Fig. 9, which is also used for grooving, it is readily noticeable that the special tool would practically have to be scrapped if the design of the work should at all change from that shown, which again brings out the point that there is good tool economy in purchasing a universal tool in preference to designing and building a special one.

For very light grooving or boring operations, especially in the softer metals, a very fast lever-feed type of tool is also available in standard form, as shown in Fig. 10. The stops on this tool can be set to lock the cutter for boring cuts or to limit the motion very accurately when taking recessing cuts.

Practical Use for a Toy in the Drafting Room

By John F. Hardecker

JACK BROWN and Bill Smith, forsaking their professional duties as chief draftsmen for an evening of recreation and play at the local vaudeville house, were enjoying a particularly good acrobatic act. They marvelled at the practical applied-engineering expressed in the perfect timing and equipment location on which the success of the feats was dependent. As Jack put it, "It looks like play to most of the audience, but I can see some mighty clever engineering in the act."

"Yes," agreed Bill, "speaking of play and engineering, I picked up a practical toy idea for drafting-room use when I visited the Royal Company some months ago. You know we have used cardboard for years to study and work out movements for our special machines. The Royal Company uses the boy's Meccano to work out valve gears and other intricate mechanisms, and it is surprising how much more readily and satisfactorily it can be done by fabricating these toy parts, than by cutting up cardboard. In fact almost any movement or structure can be duplicated with this toy, and it can be used to check the direction of stress in a complicated structure. In addition, emergency equipment for the drafting room, such as beam compasses, proportional dividers, pantographs, large calipers, etc., can often be made from it.

"So I've bought a set for our drafting room," continued Bill, "and we've used it quite a bit. We appear to be discovering new impromptu uses for it all the time, such as using two of the strips for making a safety razor-blade holder for erasing, and using the nuts to check a bill of material against the drawing. We did this checking by placing a nut on a given part in the bill of material and covering with a nut every corresponding place where the part number under consideration appears in the body of the drawing, counting the quantity as we go along. At the end, any uncovered item in either the drawing or the bill of material indicates an error or omission. When you are over our way again, I'll show it to you and you can see for yourself."

Tom Johnson Gives the Old Man a Lesson in Depreciation

By JOHN R. GODFREY

Too many shop men have fooled themselves into thinking that what they charged off as depreciation was first cousin to profit, instead of being for use in buying new equipment

TOM JOHNSON is a true son of the old man. But being a generation later he sees some things a bit more clearly, and he has a disturbing way of seeing them about as they are. Then, too, he doesn't mind calling a thing "bunk" if he thinks it is. And we of the older generation don't always relish that.

Tom wanted some new machine equipment and he put in quite a sizable requisition. The old man is usually right on the job when it comes to new machinery—but he sure balked at some of the things Tom wanted.

"Want to bust the firm, Tom?" he asked good naturedly.

"You know darn well I don't, dad. I'm hoping to get a good living out of this joint for a long time—that's why I want the new stuff."

"But you're asking for a wad of money, Tom. Where do you suppose we're going to dig it up?"

"Now see here, dad—do you think I'd ask for this stuff blindly? Don't you suppose I've got sense enough to look over the books and see what we've charged off for depreciation on the present equipment? There's been enough depreciation charged off in the past five years to buy all I'm asking for."

"Well, Tom, depreciation charges and money in the bank are two different things, you know. You don't suppose that every time we charge off depreciation we tuck that much money away in an old sock, do you? Can't let money lie idle that way, my boy."

"I know you haven't, dad—and that's why we're up against it for cash to buy new equipment. Nobody wants you to put it away where it won't be earning its keep. It ought to have gone into good bonds or even a good savings bank. But the trouble is you didn't save it at all."

"You're getting some funny notions about depreciation figures, Tom."

"Dad, I'm just learning that depreciation in most concerns is just a game of trying to put it over on the tax collector. But the joke is on us. Instead of fooling the tax man, we've been robbing the productive capacity of the plant and kidding ourselves into thinking we were making a lot of money."

"Those are pretty strong words, son."

"I know it, dad—but they're true. And don't get the idea that I think we are the only sinners. Probably every plant in town is guilty of the same game."

"Son, I don't just like the sound of that word guilty. Sort of makes me feel as though I'd been caught stealing chickens, or bootlegging, or something."

"Don't worry about being caught, dad—we haven't hurt anyone but ourselves. We've been drawing dividends we didn't really earn. Using money that ought to have gone into an equipment reserve fund."

"We've always had pretty good equipment, Tom. Guess we can make our motors as cheaply as the rest of 'em."

"That's just the trouble, dad. We're in with the bunch when we ought to be leaders. If I could get some of those new machines I saw at the Cleveland show, I'd cut costs more than we've ever done before. If we had the money that has been charged off in the depreciation, as we should, I'd make your eyes stick out at the dividends next year, dad."

"Never heard of tying up a lot of money in reserve for equipment, son. Of course we keep a fair bank balance but nothing like what we've charged off. Nobody does, Tom."

"Then we're going to start right now, dad. Every cent that is charged off for depreciation is going to be considered as a fixed charge against productive capacity. It doesn't belong in the profit side at all. We've got to count our dividend earnings after we've tucked the amount of depreciation away in some good, safe bonds, even if we only get four per cent—something that we can turn into cash when we need new equipment. Then,

According to young Tom Johnson there is a lot of misunderstanding—as well as plain bunk—in our ideas and practices of charging off depreciation of machine equipment. He contends that unless the amount charged off is available for new equipment, the production department isn't getting a square deal

if there's any net after that we can think about dividends, and new cars, and trips to Europe, or anything else."

"What if we don't earn enough for dividends, figured that way?"

"Then we've only been kidding ourselves that we got a good price for our motors. If the price doesn't leave us enough to replace equipment and pay dividends too, then the price is too low and we aren't really making money. Unless we maintain our productive capacity by buying new equipment whenever we really need it, we'll be flirting with the sheriff one of these days."

"Sounds like pretty tough medicine to me, Tom. But maybe you're right. We'll see if we can't dig up a little cash now and get some of those new machines you want."

About This Second-Hand Machinery Business

By Cyril J. Bath

IN VIEW of the general spirit of amity supposed, at this happy season, to prevail among even the more hardened people, I venture to bring up a subject quite generally avoided between machinery manufacturers and their—reputedly — natural enemies, the second-hand dealers.

Before going any further, I might as well make it clear that this is purely a trade scrap and such ultimate consumers as may have chanced across this page, shouldn't really bother themselves about the matter in question at all.

The fact is, however, that for some time many manufacturers of machine tools have viewed with alarm, not to say distaste, the purveyors of used machinery. Not, mind you, that I'm at all surprised. They naturally object to losing sales to their own resold tools. Often, too, these machines have been doctored to look well but when put to use, they prove very troublesome both to the buyer and the man who made them. The tool still bears the manufacturer's name and to some extent at least carries his reputation. I'll say, too, that a distressingly large percentage of second-hand tools floating around at so-called bargain prices, should be fed to the well known cupola in suitable sections.

Availability of Good Used Tools Helped Many Get Started

On the other hand, the rapid improvement in machine tool design entails an increasingly difficult job of disposing of the older model machines which still have a sound and useful function elsewhere. Many users could not afford to buy new tools were it not for the salvage on the tools displaced. Many a buyer of new tools could never have started in business if he had not been able to conserve his original capital by the purchase of second-hand equipment. There is a proper place for even quite old tools, especially of the larger variety, and they give good service too.

A very wealthy manufacturing company recently bought a large boring mill. I hate to tell you just how old it was. It was sound and true, and inasmuch as it only ran on breakdown jobs, occurring once or twice a year, the investment involved in a new machine would have been out of the question. There is a surprisingly large market for used equipment in just such jobs as this. It is a legitimate market for used machines.

The manufacturers of motor cars have had this situation to face in a far more aggravated form and for a long time. They have gone a long way toward a proper solution.

Used machinery dealers are finding, to their cost, that there is no money in selling junk as machine tools. Let the manufacturers help them all they can, to the end that the tools they do sell, shall give satisfaction. It certainly seems to me that the very important function of reselling tools that no longer fill their original function, might very fittingly harmonize more closely with the prime function of making them.

The Attitude Toward Apprenticeship

By A. W. Forbes

SOME who have spent time and money in training apprentices feel that the commandment "Thou Shalt not Steal" applies to apprentices as well as to material commodities. Aside from the question of classing apprentices as commodities, is not this attitude one of the chief reasons for the decline of apprenticeship? Boys will spend four years in a trade school to learn a trade without pay, but will not accept a better training in apprenticeship unless well paid. One reason is that the trade school gives lists of graduates who are making good in various industries, nearby and in distant cities. The boy expects to choose from a long list of organizations and he expects the school will help him choose.

One company announces that 60 per cent of its apprentices remain. What inducement is that to boys? They may choose to stay, but the fact is just as easily explained by the theory that the training is not good enough so that they can secure good jobs elsewhere. Whatever the cause, an intelligent boy is not going to a place for his training where there will be difficulty about leaving.

Apprenticeship was most successful in those times when apprentices were not expected to stay with their masters. Then, wealthy families paid well to have their sons accepted by the most desirable masters. One thing that is needed to restore apparent apprenticeship to its proper place is some kind of information office where employers can see the records of all graduate apprentices, and make their offers directly to the graduates. Create a demand for apprentices and boys will come in plenty.

Apprenticeship is a business proposition where both employer and employee should profit, and should be kept on a sound business basis. What would you think of a store that sold to its new customers for four years at less than cost, with the hope that it would retain these customers later? Such unsound business practices would be condemned by all storekeepers. Some present systems suggest that the employer spends time and money in training apprentices, which presumably means that he should pay the apprentice in money or instruction more than his work is worth. That is just as unsound a practice as that of the storekeeper. It is bound to result in an effort to keep the apprentice after his time is up.

To My Job

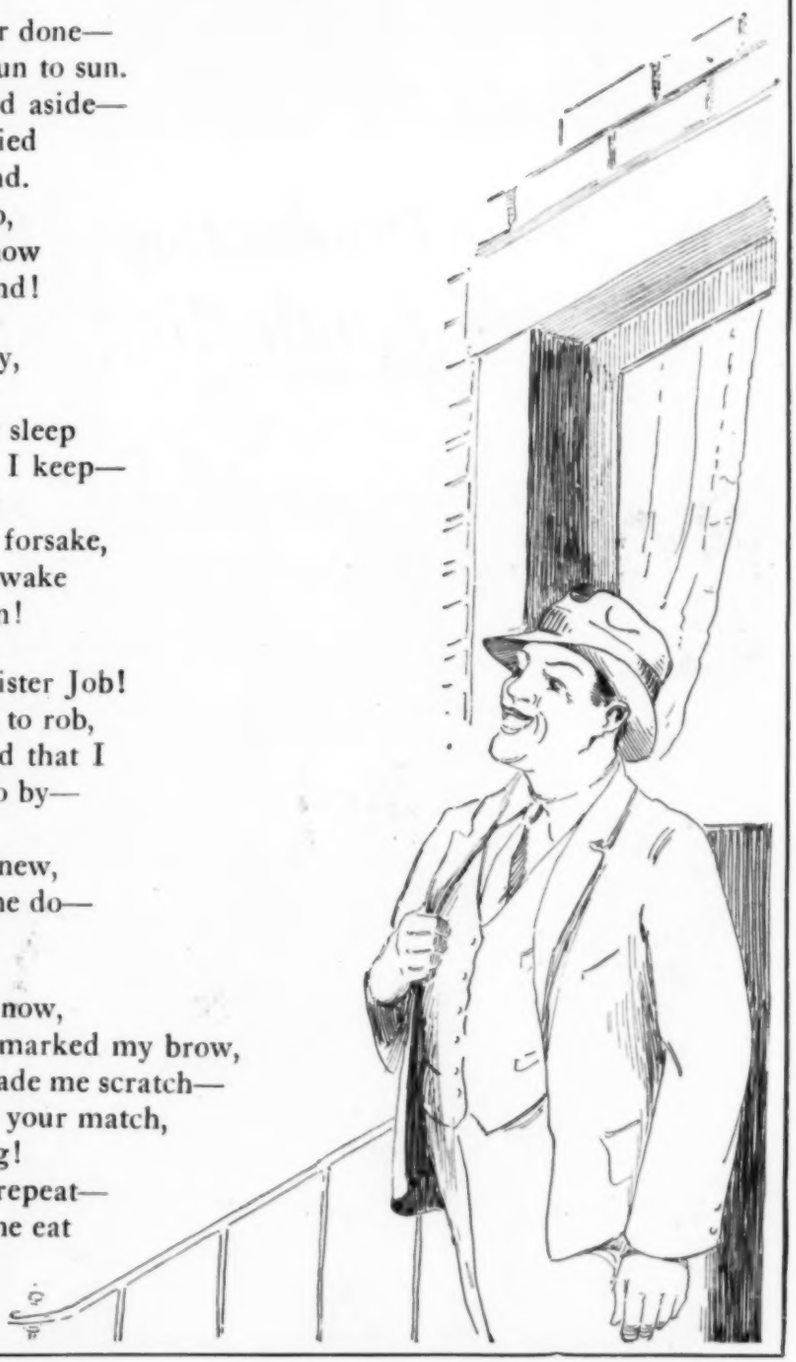
By Charles S. Kinnison

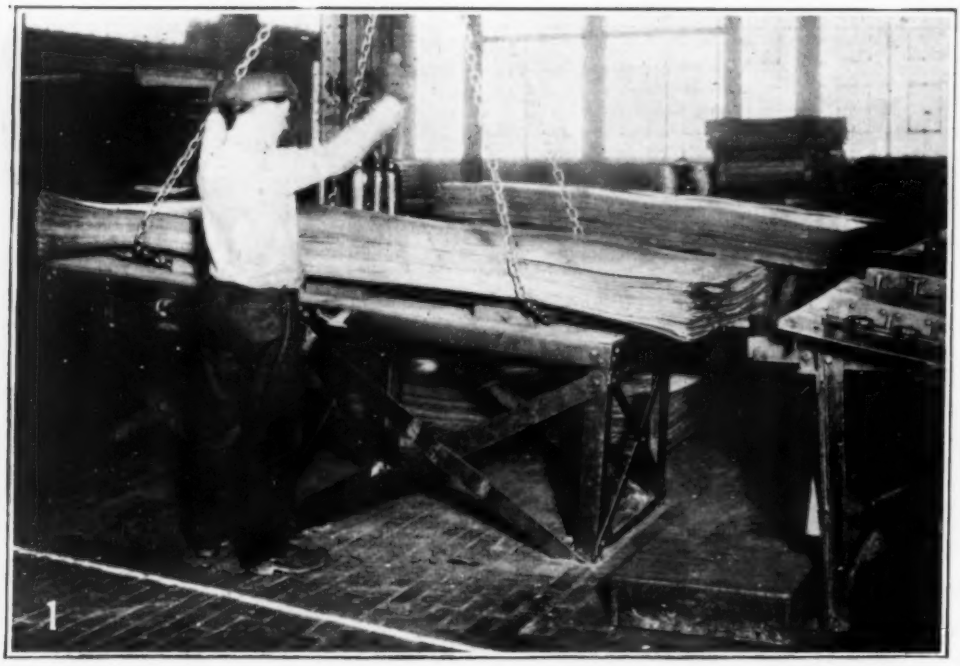
Your round of cares is never done—
You make me work from sun to sun.
You simply *won't* be pushed aside—
And I confess I've often tried
To dodge what you demand.
However far from you I go,
When I get back, alas, I know
You'll be right there, at hand!

And even when I try to play,
Or rest a bit, at end of day,
You follow me—and in my sleep
Your company, still, I find I keep—
You simply won't be gone!
My weary mind you won't forsake,
And well I know when I awake
You'll still be there at dawn!

But here's the joke, Old Mister Job!
Altho my strength you seek to rob,
When morning comes I find that I
Have let your worries all go by—
My day I'm glad to start!
I find that I have strength anew,
For every task you'd have me do—
And song is in my heart!

So let me tell you here and now,
That while it's true you've marked my brow,
With furrows deep—and made me scratch—
In me, Old Job, you've met your match,
I'll lick each task you bring!
You make me dig—may I repeat—
But still, Old Job, you let me eat
And so to you I sing!





In this country the method used for insulating electric motor laminations is to apply insulating varnish to both sides of the steel sheet. A load of sheets, weighing about 5,000 lb., is placed upon the feeding table, Fig. 1, and fed one by one between the enameling rolls

In Fig. 2 is shown the enameling machine. The operator feeds at the rate of 80 sheets per min. The enameling rolls consist of two iron cores, over each of which is shrunk a tubular felt about $\frac{1}{2}$ in. thick. The lower roll is driven by a chain, and revolves in a reservoir of varnish, which is pumped from an underground tank through a circulating system

Production Methods in Enameling Sheet Steel

Photographs submitted by P. J. Edmonds
Westinghouse Electric and Manufacturing Co.

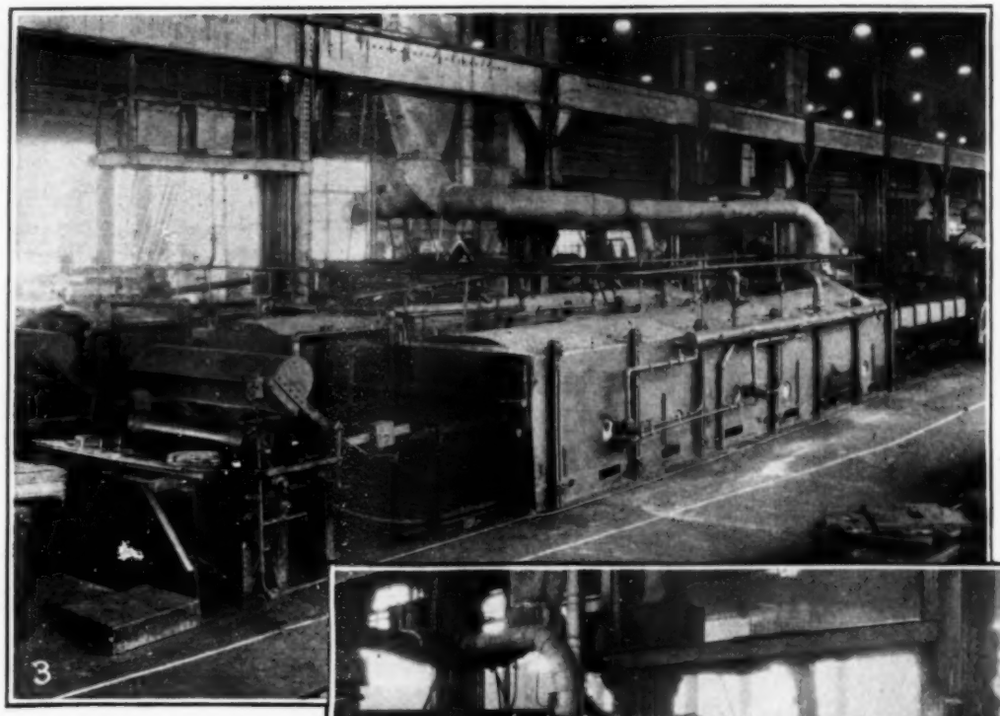


Fig. 3—The conveyor from the varnishing machine at the left carries the varnished sheets through the gas-fired furnace, which is about 30 ft. long. The sheets are "flash baked" by permitting the gas to ignite the solvent of the varnish

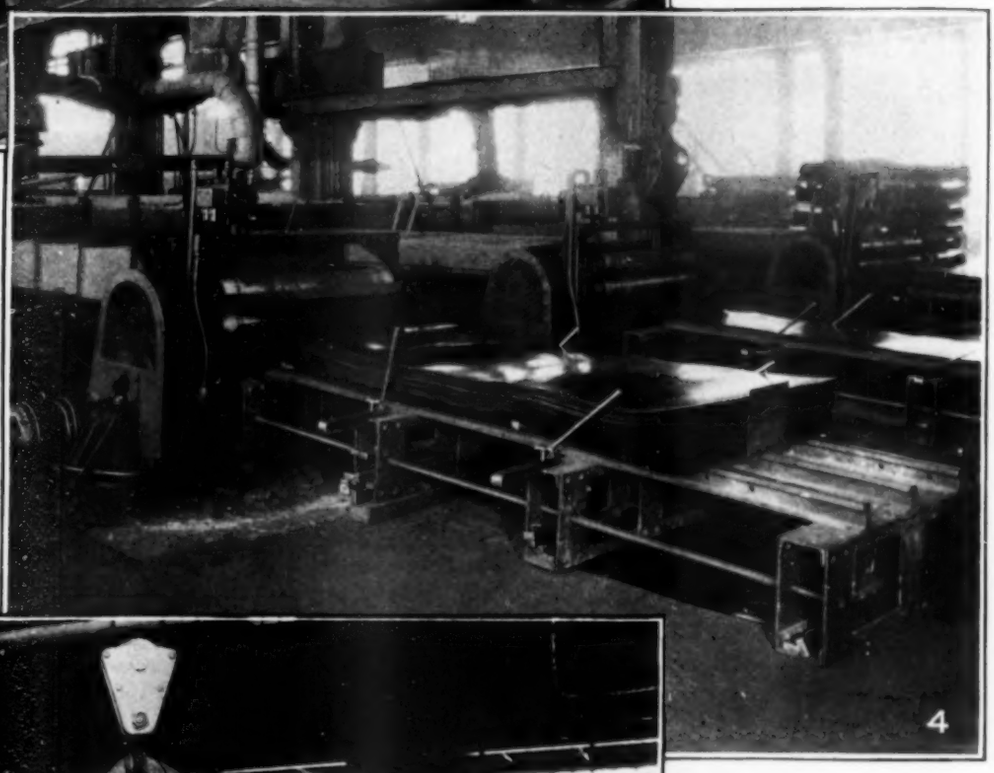


Fig. 4—The stacking rolls automatically receive the sheets from the conveyor. The rolls are 5 in. in diameter. The lower one travels by power, and the upper one by friction from the sheet. The speed is regulated so that the sheet is shot out on the cooling table

Fig. 5—A special lifting device, handled by crane, is employed to remove the piles of sheets from the cooling table. The jaws operate by means of a capstan screw at the top, and can be quickly adjusted and locked under the load of sheets

A Double-Acting Trunnion Drill Jig

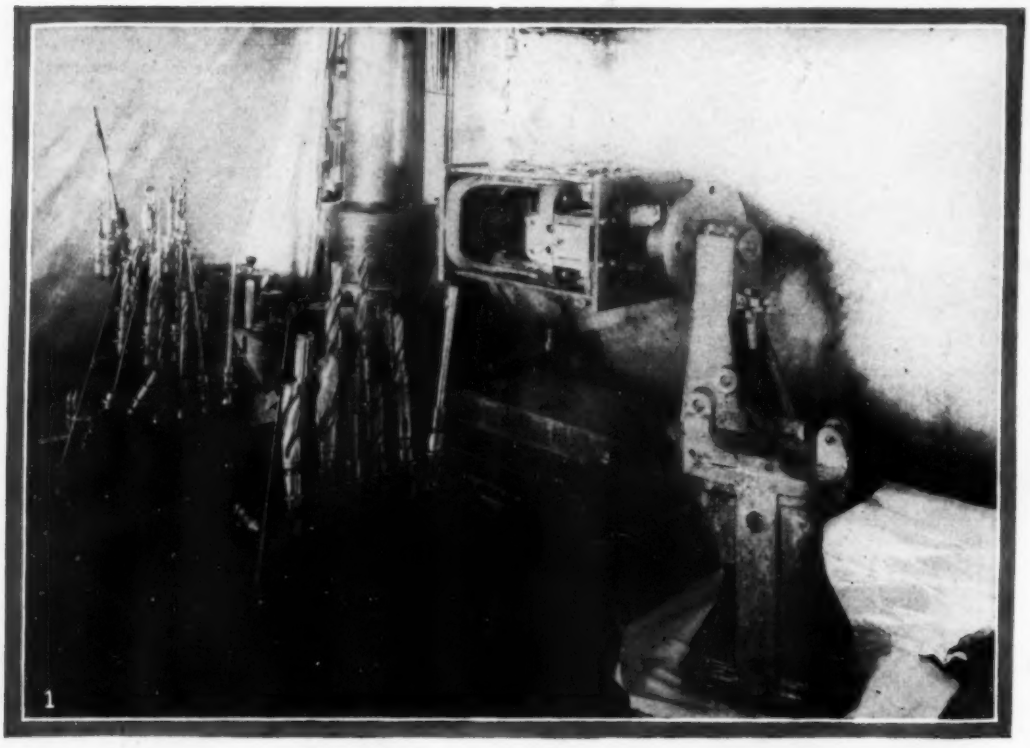
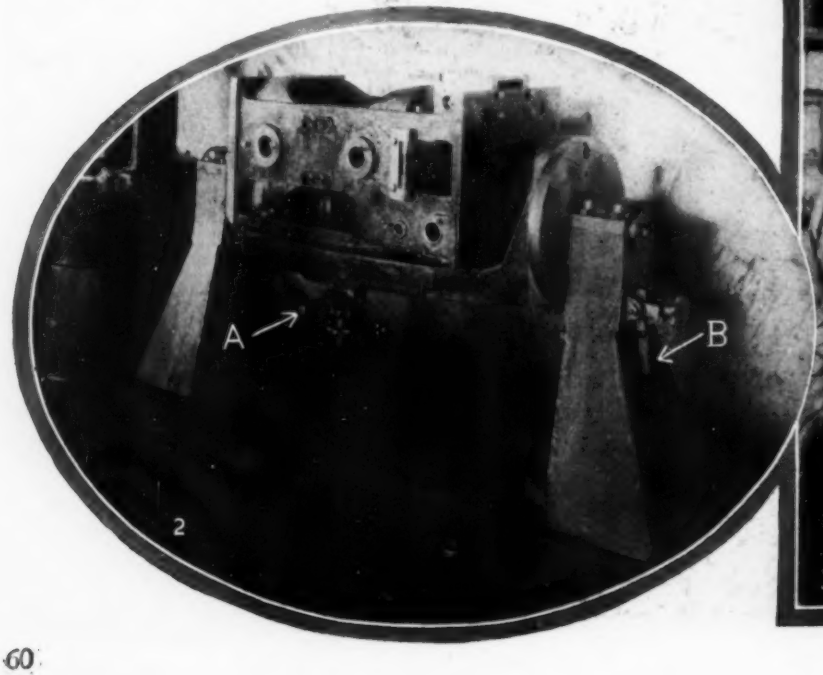


Fig. 1—The work, the tools and the jig. A little study of the work and the jig will show how the piece fits inside. The jig is an excellent example of the double-trunnion type, which is not found in the average shop. All the tools used are carried in the steel racks at the left. The racks are triangular in shape and are so arranged that the tools are held at different levels and in such a way as to avoid interference. The tool stand at the left has an additional shelf at the top, in order to accommodate all the tools necessary

Fig. 2—The supporting trunnions are clearly shown. The indexing latch at *A* controls the third movement of the drill jig, which is shown in Fig. 3, while at *B* is the latch controlling the horizontal revolution. As will be seen, this jig is carefully designed and substantially built. Fig. 3—The other trunnion. This view shows the use of the second trunnion in swinging the piece to be drilled, so as to present either end to the drill spindle. The indexing latch *A*, Fig. 2, controls the position of the jig in presenting either end for operation. With this type of drill jig all six sides of a casting can be drilled and tapped at the one setting, providing of course that there are no holes to be drilled or tapped on the portion covered by the second trunnion. In this case the casting is open at the side, so that all holes can be readily reached in any of the six positions

Photographs by courtesy of the General Electric Co.



The Trade School in a Democracy

By Herman S. Hall

Director, State Trade School, New Britain, Conn.

THE trade school as a democratic institution should serve all the people, without regard to age or sex, type of training wanted, or the amount of time the individual can devote to training.

Of late there has been a tendency on the part of trade schools not to limit their service to the younger boys and girls who can attend regularly, but to extend it increasingly to mature men and women, who are permitted to attend during such hours as they may find possible. Such students are not required to take prescribed courses but may devote their time to acquiring the particular kind of knowledge or skill they seek. This is a tendency in the right direction. Public funds are well spent in serving the man or woman who is willing to make the sacrifice usually necessary in order to secure needed training.

Some question has been raised as to the advisability of requiring even young boys and girls to complete a definite number of school hours, or a prescribed course; the thought being that when a youth feels he has secured the training he needs, he should be free to seek employment. Such a plan would appear, however, to leave too much to immature youth to decide, for in most cases the influence exerted by the parents would be negligible and the youth himself would be making the decision. In many ways it would seem better for the school to determine minimum standards of proficiency, and then to exert its influence to keep the youth in school until at least this minimum had been acquired.

Organize Intercity Courses

In the past, the tendency has been, unfortunately, to offer training in only a few of the more common shop and building trades. If financial or other conditions limit the scope of a school's activities, it is logical that it should devote its efforts to serving as many individuals as possible, but it seems undemocratic, even in a city where industrial pursuits predominate, to offer vocational training at public expense to a boy who wishes to become a toolmaker, yet to devote no part of the public funds to training the boy who would rather become a barber or a meat cutter. The matter of offering equal privileges to all, regardless of the vocation they desire to follow, is one of the major problems in vocational education.

In thickly settled portions of the country, it may be possible to solve this problem by organizing the trade schools of near-by cities so there will be no duplication of effort. One city may offer instruction in a certain group of trades while the schools of other cities may offer instructions in other trades. Under such a plan each boy and girl could attend the school offering instruction in the particular trade he or she wanted to learn, even though it might involve commuting to another city. There is some tendency toward this plan in certain eastern states, but it does not seem to offer a complete solution of the problem.

It appears not improbable that some modification may be made in the present general attendance plan of the all-day trade courses. The present abrupt transition from school to industry may be modified to the advantage of both apprentice and employer. On leaving school the apprentice may be placed or required to find employment under such conditions that the school can follow him up, receive reports upon his work and progress, and possibly use its influence to bring about a change of work if he does not receive the proper experience.

This close contact of the school with industry would provide the school with means to check up its own efficiency, and at the same time to guard the interests of the boy and, to some extent, those of industry. The boy would be under the supervision of the school to some extent as well as under the supervision of his employer.

This plan might or might not result in changing the length of time that a boy is expected to remain in school, but it certainly would increase the length of time he was under the supervision of the school. Possibly experience would show that two years in school and one year in employment under joint supervision of school and employer would be required for his journeyman's papers.

This scheme would eliminate some of the difficulties of the all-day unit trade school and would be an improvement upon the usual part-time trade extension plan, though the apprentice might, under the new plan, be required to attend the school one or more half days each week if his employer found him deficient in certain branches of knowledge or skill.

The trade school is efficient in proportion as it serves the needs of all people. It can serve the needs of all in proportion only as co-operation is given it by the public, the industrial workers and the employers.

About 45 Years Ago

(From the *American Machinist*)

The Gandy Belting Company, Pittsburgh, is about to manufacture cotton belting made of cotton duck, folded and sewed after being saturated with a composition.

The Pope Manufacturing Company states that bicycle riding is unsurpassed as a method of travel, whether for speed, sport, or the renewal of health.

The Hendey Machine Company, Wolcottville, Conn., doubled its capacity for building planers and shapers in 1880, and is again doubling facilities.

If some plan can be put in practice for storing up and conveying to a distance the immense power going to waste at Niagara, its projector would be hailed as one of the greatest public benefactors.

Iron cut nails are fast going out of fashion. Wire nails are coming into use with great rapidity, and the designing of machinery for making them is taking the inventive ability of many good mechanics.

A wire rope more than six miles long and 1¼ in. thick is being manufactured at the Hazard Works, Wilkes-Barre, for the Third Avenue cable railway in New York.

Mr. Andrew Carnegie, of the Edgar Thomson Steel Works, has been encouraging the employees to aid their condition by starting a co-operative store, and thus obtain in a small way the responsibilities of capitalists.

B. F. Sturtevant is employing 150 workmen, full time, at his extensive blower plant at Jamaica Plains, Mass. He does all his boiler work, as well as brass and iron casting.

THE · FOREMAN'S · ROUND · TABLE

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"They Set Their Own Rates"

AL HADN'T said a word during the half hour that had passed since the noon whistle. He had munched away, and replied to Ed's comments and questions by absent nods. Finally he nodded acquiescence to a question that clearly demanded a negative answer. This was too much for Ed.

"What's eating you?" he burst out. "You've sat there like a wooden image, except for your jaws and your Adam's apple, ever since quitting time, and I'll bet you haven't heard a word I've said."

"Sorry, Ed, I don't believe I have," admitted his companion. "I can't get my mind off something my brother Jim told me yesterday."

"Well, what was it? Not a family skeleton, is it?"

"Oh, no. You know he's a foreman over at the Catlin plant in North Elwood. They've got a new manager over there, young fellow with a lot of ideas, but the men are eating out of his hand. Jim says he's put over some stunts that the old timers knew wouldn't work, and he told me about them, but the one that gets me all excited is the latest one. The men in some departments set their own piece rates. What do you know about that?"

"I know the guy is crazy," snorted Ed. "The men in that shop will be able to retire in five years if the company doesn't go broke sooner. I'll bet the rate they set is a fine fat one."

"That's what I thought, too, Ed, but Jim says that they set a real job for themselves. The old super couldn't see this stuff any more than you can, so he had his rate-setter go over the jobs first, on the quiet, and set as close a rate as he dared on each one. But, by golly, when the men's rates came in they were lower than the rate-setter's on every job but six."

"The devil you say!" Ed looked his amazement. "Well, that new manager must have made them believe he was on the level, all right."

"Perhaps that's the answer, Ed. I wonder if we could get away with anything like that here."

*Is it safe to let the men set their own rates in the average plant? **Why?***
Is Ed right in his guess as to the reason in the Catlin plant?

All foremen are urged to discuss these questions. Acceptable letters will be paid for

Discussion of Earlier Topics

Making Time Studies

IT MUST be an antiquated time-study department that uses secret timing. I have been doing time study for the past ten years, and have never found any reason to use it.

When taking the time study on an operator who "soldiers," the division of the operation into its elements plays a very important part. During one cycle of motions, he will slow up, but he will not be able to "lay down" consistently on the same one, or if he does, it will be found that in timing another workman doing the same work he does not "soldier" through the same cycle.

The time study man should treat the operator as one sharing in the investigation, and should endeavor to win his interest and co-operation. The stop watch should be shown to the operator, and its use explained. I have even had operators time each other, in order to prove certain doubtful points in a study. —L. A. DROMAN.

THE best asset a time-study man can have is the respect and good will of those he studies. It has been my practice to explain to each new man what I expect of him on the operation under consideration, how I want it done, what benefit he can secure by co-operating with me, and the fact that my impression of his efficiency will effect the allowance on the job. I can call every man by name whom I have ever studied, and find that by an open, frank friendliness toward all of them I usually get a "square deal."

Another advantage of this system is that men are eager to suggest different methods, machines, jigs, fixtures, etc. Often these suggestions lead to a distinct saving in production cost. Were the rates taken by the under-cover method, all desire, naturally, to help time-study men would vanish, and their presence in the department would be dreaded. —L. E. BACON.

IN CONSIDERING a new job, I determine what tooling and set-up I will use, instruct the operator, and then work out the cutting speed, depth of cut, and feed. When we have the job thus far advanced, I call in the time-study man, who openly records the time it requires to complete a piece, making customary allowances.

As the men realize that I "know my stuff" fairly well, and that I must approve these time studies, there is little to be gained by an attempt to hold out. On the other hand, they receive a square deal from us, so that in following their instructions and using the rate established, they actually make their incentive wage. The time-study man is not permitted to engage in any discussion or criticism of the method with the operator. If he has any objections or suggestions, he is required to take them up with the foreman, who will take the steps necessary. In avoiding friction with the men, much depends on the personality of the time-study man. —CLARENCE FOSS.

THE·NEXT·TOPIC

Is the Kicker Always a Nuisance?

ADVANCE QUESTION

One of Ed's men continued to kick about a hole in the floor near his machine. Ed called him a nuisance. Al thought there ought to be more kickers of the same kind. What do you think?

Posting Too Many Rules

ALIVE foreman who understands his job works with the men, and puts his ideas across by the power of suggestion, helping to build the morale of each individual and thereby building up the morale of the whole shop.

Suppose a foreman goes to Bill, who runs the planer, and asks him to keep his machine and surrounding floor space clean. That request came directly from the foreman, and if Bill has any respect for him, he will see that the floor and machines are kept clean. But, suppose this same request was a printed rule tacked up on the bulletin board. Bill is coming down the aisle, and loafs long enough to get the drift of the new notice, then goes over to his buddy who works alongside of him, and says, "What the heck is the matter with them dicks up in the office? If they want it clean, let 'em come down and clean it." —A. W. LOVELL.

THE foreman is the recognized custodian of everything affecting the behavior of the men under his charge, and if he is the man he should be, he permits no one to usurp his authority in that field. If certain rules and regulations are issued from the office, they should pass to the foreman first, and he should be the competent judge as to whether the notices should be posted verbatim or abridged, or whether they should not be posted at all. Any rule that does not secure the personal approval of the foreman has little prospect of being properly obeyed. —J. T. TOWLSON, *England*.

Getting Ideas from New Men

THE most prosperous firms are the ones that have foremen who encourage their men to think and suggest ideas to help the work. Personally, I find this method of getting men to think breeds contentment. Furthermore, I know that the reason why I climbed to the position of foreman is due to the fact that I was encouraged to think out and apply new ideas. Therefore,

I see to it that I give the same encouragement to my men.

The quickest way by which a foreman can invite trouble in his department is by doing his work in the same old way day after day. Progress is the outcome of the application of new ideas, and to be progressive, therefore, a foreman should train his men to think and apply ideas to speed up his job.

—C. L. HENRY, *Foreman, England.*

Calling Down the "Old Man's" Relatives

IF AN insurance inspector should have happened by while said old man's relatives were indulging in a perfecto, or more likely in a cigarette, he would have noted it on his report without trying to find out who the privileged one was, and then later on the old man might have blamed the watchman for not having the rules observed. My idea in this matter is that rules are made to be obeyed by one and all, and in this way accidents, mistakes, costly errors, and unpleasant call-downs are avoided. —FRED KLINGENSTEIN.

TO KEEP harmony amongst the production personnel, no one, regardless of his status in the plant, should be permitted to take liberties which are against an existing rule. Infringement of a rule by a visiting party will bear directly upon the attitude of the production force, and will tend to cause them to alter their former regard for the observance of the rules. Consequently, they will take the privilege upon themselves when the occasion presents itself at some future date.

—JOSEPH STROBEL.

WILLIAMS would certainly lower his standing with his help if he called the watchman or attempted to reprimand the man for doing his duty. The nephew should be dealt with as any other employee of the shop. The rules were evaded, and those who evade rules which effect shop discipline and general welfare should certainly be dealt with accordingly. The proper handling of this case by Williams is most important in its effect upon the morale of the employees in the shop.

—T. O. ARMSTRONG, *Supervisor.*

WHEN a concern establishes rules, it should make them with the idea of having them apply to everyone. If not, it is wiser not to have any rules at all, because when relatives break rules it naturally antagonizes the other employees, and they feel that they, too, should have the same allowances. It is impossible to expect co-operation from other employees if relatives are privileged characters. —L. CLOSE.

Keeping Track of Improvements

IN MANY cases the shop does experience difficulty when suggesting improvements, as many designers are more concerned with theory than practice. They fail to see how practical men engaged on mechanical work have any interest in anything beyond their own machines. Other shops are very good in this respect, and the practical man can have his say.

But the designer should also receive certain credit, for no matter how good the suggestion may be, it will generally call for considerable skill on the part of the designer to enable it to be adopted, because the largely practical men in the shop often fail to appreciate some of its disadvantages. The follow-up form should be practical, and should be delivered to a responsible official, and sent back again if not adopted. It is inadvisable to allow minor officials to handle these suggestions, as they may reject them on minor or personal grounds.

—W. E. WARNER, *England.*

THE small employer can receive suggestions directly, and can remember and recompense the originator. His advantage over the large firm lies in his immediate personal touch. This is the key to the situation. To insure for the man a square deal in the large organization, a substitute for the small employer should be provided. That is, the workman should be able to communicate directly with some impartial authority. This individual, of course, should not be connected with the designing department. The all-important point is to make the first step easy. Later on, an impartial committee, meeting periodically, could deal with the suggestions submitted. —F. C. EDWARDS, *England.*

Christmas Parties for the Plant

SPEAKING of Christmas parties for the shop, reminds me that sometime ago I was employed where one was given. The firm hired a chef, and he roasted a stuffed shoat in one of the electric heat-treating furnaces. At six o'clock we, including the owner and manager, went to the top floor of the factory and sat down and enjoyed the bounteous repast of the aforesaid shoat and trimmings, coffee, ice cream, and cigars for the men. We then played cards or danced to music from a piano furnished by the purchasing agent. Everyone had a good time, and hoped they would have another. All the expense was borne by the owner.

—DAVID T. FLETCHER.

Side Tracking an Old Customer

IF THROUGH some unforeseen conditions it is discovered that the order for the new customer cannot be delivered on time, the management should get into communication with the new customer. He should explain the complications that have developed. The possibilities are that Mr. Brown has had the same conditions developed in his line of business, and would be willing to extend the time limit.

If Mr. Brown cannot grant the extension of time asked for, the only logical solution is for the plant to work overtime. This, we all know, is not a profitable procedure, but the manufacturer must keep his delivery promises if he intends to hold his business. The new customer must also get his order on time, regardless of whether or not a profit is realized on his first order.

—T. H. PARKE.

AL IS right in stating that the old customer should be taken care of in preference to the new. The old customer has sent his orders for some time, and is entitled to first consideration. The new customer may be simply shopping around, and his first order may be his last. It may be general practice to give preference to new customers' orders, but certainly it is not good practice. —V. E. ATWELL.

IDEAS · FROM · PRACTICAL · MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Toolmakers' Hammer—*Discussion*

By James McIntosh

In an article under the title given above, on page 785, Vol. 67, of the *American Machinist,* Jim Henderson describes a toolmakers' hammer that, while ornamental when considered as a utility tool, is too expensive to make. Besides, in service the soft pieces in the ends will soon be battered-up to the point where they cannot be removed from the collars without turning off the upset ends.

I can recall that the tools supplied to the engine rooms of steamers, included two sizes of copper and lead hammers. The heads were cast and holes were cored in them to fit the ordinary wooden handles. As satisfactory tools they filled the bill, and they had the advantage of being cheap and easily duplicated.

Perhaps the most usual method of making a soft-headed, general-utility hammer, is to cast lead, or babbitt, in the ends of a Tee fitting, screwing a piece of pipe in the side opening for a handle. When the soft metal in such a hammer gets battered-up, it is a simple matter to melt it out and refill the fitting.

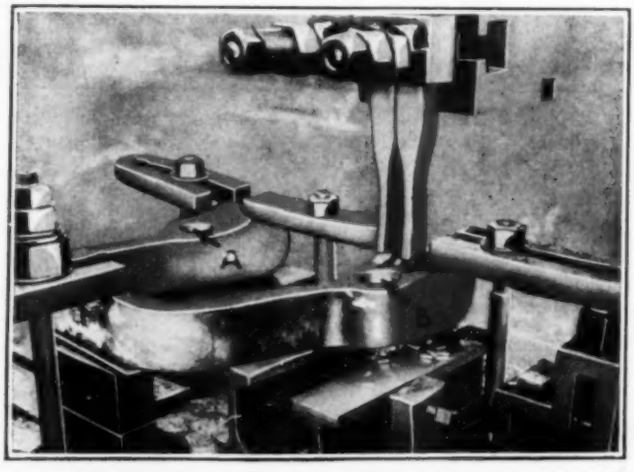
Simultaneous Use of Two Tools

By Milton Wright

In slotting the yoke ears of spring hangers for locomotives, the general practice is to use a single tool in the toolholder of the slotter ram. Holes, of course, are drilled at *A* and *B* where the cuts are to end, as shown in the illustration, and several cuts are necessary to get a smooth job.

At the Billerica shops of the Boston & Maine Railroad the work is done with one pass of the two tools shown in the toolholder. Though it is necessary to feed a trifle more slowly than when but one tool was used, the work is done when the tools reach the drilled hole. Instead of reducing to chips all of the metal between the ears of the yoke, that part of the material comes out as a solid chunk of steel.

No special appliances whatever are needed for this job; it is simply a case of the workman using his thinking apparatus to reason out that if two tools were put in the place where previously there had been one, the work might be done in about half the time.

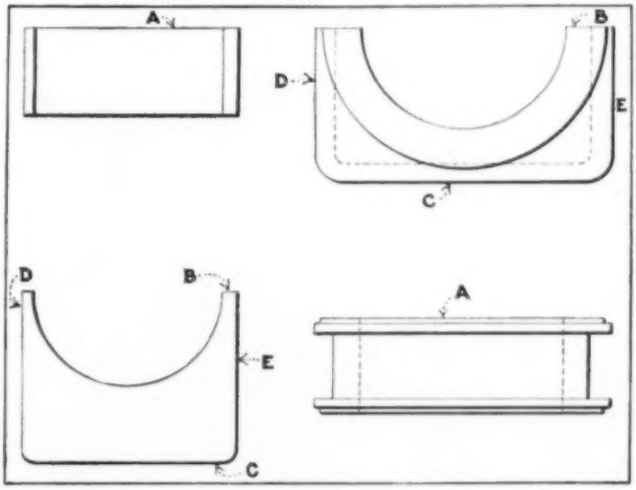


Using two tools simultaneously

Machining Front-End, Main-Rod Brasses—*Discussion*

By C. G. Williams

The first time I ever saw the mandrel for main-rod brasses that J. H. Hahn describes on page 506, Vol. 67, of the *American Machinist* was down on the "Old" Iron Mountain Railroad, long before it became part of the Missouri Pacific. This device has bobbed up from time-to-time, but always runs a short race. As a production or utility device it is of little value, and soon finds its way to the scrap or junk pile.



Main-rod brasses for locomotives

In this day of production, the progressive shop either mills brasses or has a long angle plate that can be clamped on the "long" planer. The half sections of the brasses are clamped to this plate and one side is run over, as at *A* in the sketch herewith. This side is now placed against the angle plate and the joint-face *B* is machined. The brass is now set up on the joint-face, still with the

machined side against the angle plate, and the back *C* is faced off. The brasses are now set up back-to-back and the edge *D* is machined. The remaining edge *E* soon follows.

As twenty brasses can be set up at once, using both sides of the angle plate, it does not take long to plane them. When the machining has been completed, the halves are sweated together at the joint and the brasses are placed in the storeroom, from whence they are drawn out to be bored and faced in a single lathe operation to required diameter and thickness, for the pins on which they are to be used.

The brasses for the back ends of the rods are machined in the same way, and follow the same sequence, as indicated in the sketch.

Determining the Direction of Thrust of Worm Gears

By Walter Charles

IN THE design of new machines it becomes necessary to determine the proper kind of worm gears to use in order that the thrust of the worm and the rotation of the driven wormwheel will be in the desired direction. The characteristics that determine the direction of the worm thrust and the rotation of the mating wormwheel are the direction of rotation and the "hand" of the worm. With any possible combination of direction of rotation and "hand" of the members, they can readily be found by the use of this simple rule:

Place your hand corresponding to the "hand" of the worm so that the fingers curve and point in the direction of the rotation of the worm. Then the extended thumb will indicate the direction of thrust, and the mating wormwheel will rotate (at the point of tangency of the gears) in a direction opposite to that of the thrust.

If, for example, we have, as at *A* in the accompanying chart, a worm rotating in mesh with a wormwheel, and conditions require us to determine the direction of thrust and rotation of the worm as shown, what hand worm must be used? Knowing the direction of the thrust of the worm, we shall find by applying the rule that the wheel rotates in the direction opposite that of the thrust at the point of mesh. It will also be found that the left hand, placed so that the fingers curve in the direction of rotation of the worm, indicates the direction of thrust to be in the right direction, so that a left-hand worm running as shown, will be needed.

Suppose, now, that the direction of rotation of the wormwheel and worm are given and the thrust of each and the hand of the worm are to be determined, as at *H*. The thrust of the worm is in a direction opposing the direction of rotation of the wheel (at point of mesh), that is, to the left. Knowing now the direction of thrust, we shall find that the right hand only will meet the conditions; therefore, the worm is a right-hand worm. Due to the friction of the worm on the wheel the direction of thrust of the wormwheel is always in the same direction as the direction of rotation of the worm.

To illustrate still another case, a right-hand worm is shown at *D* running in the direction indicated, and the direction of the thrust of the worm and the rotation of the wormwheel are to be determined. Applying the rule, we place the *right* hand so that the fingers curve in the direction of rotation of the worm, then the thumb will give us the direction of its thrust.

Once this rule is understood it is always available, for it is easily remembered, and diagrams, such as the ones given, then become unnecessary.

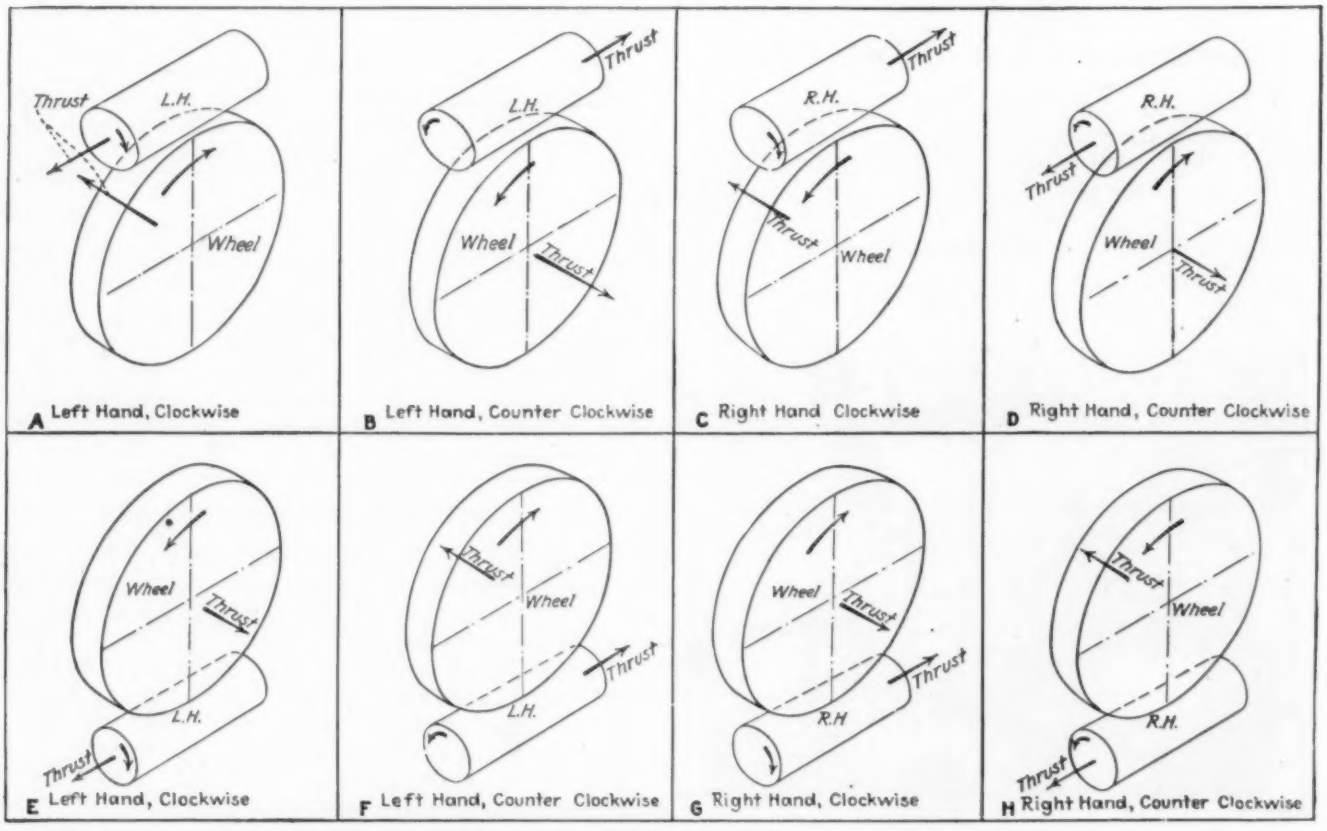
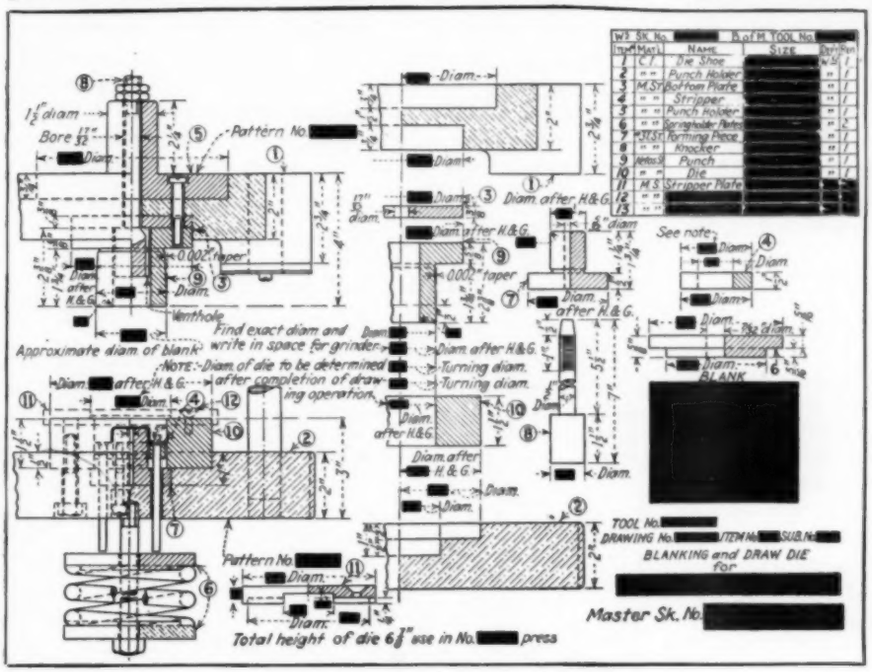


Chart showing thrust on worm for all possible conditions of position and "hand"

Standardizing Tool Drawings

By G. B. Stuart

In the tool design department of a large electrical plant where new die and tool designs are constantly being made, it was found that these designs were following general trends. It was, therefore, found to be possible not only to standardize many of the details of the tools, but also to classify them, and to prepare in advance assembly and detail drawings with all dimensions and material specifications filled in, with the exception of the variable points on the working surfaces of the die or other tool.



Master drawing of standardized die

In the accompanying illustration is shown one of the standardized drawings of a cupping die. When an order is received from the punch press department for a die of this general classification, a brown print is drawn from the files, and the designer fills in the required dimensions in the white rectangular space left in the dimension lines to suit the work. In the illustration, these spaces are shown in black. A white print can then be obtained from the brown print. Very large savings of time in the engineering department are being made by this system, and it is especially helpful when rush jobs are required with new drawings to be made.

Turning Snap Rings for Pistons and Piston Valves

By Ellsworth Sheldon

When turning a snap ring for a piston it is necessary to take the final cut over the outside diameter after the gap is cut and while the ring is squeezed together to close the joint. Only when this condition is met can the ring be expected to be round and to hug the cylinder wall at all points when in service. This job is usually designated as "turning the rings with the snap in them." In the Billerica shops of the Boston & Maine railroad rings are turned in two ways, depending upon their size.

The pile of castings to be seen in Fig. 1 are pot castings from which rings are to be made for the piston valves of locomotives. When the castings come from the foundry they go first to a milling machine where a slot is cut clear through the wall along one side, with a pair of saws spaced apart to a distance equal to the amount of metal to be cut out to give the rings the desired snap. This amount is about $\frac{5}{8}$ in., but it varies with the size of the ring.

Clamping bands are then placed around the casting and pressure is applied to close the gap tightly together. Then the oxyacetylene torch is used to make a weld at the top and bottom of the joint. All of the castings to be seen in Fig. 1 have been so treated, but the joint and welds may be seen to better advantage in the casting in the immediate foreground. A casting is then clamped by the three lugs at one end to the table of a vertical boring mill—that being the sole purpose of the lugs—to be bored and turned to finish diameters without disturbing the welds at the ends.

A clamping band, made for the purpose, is now closed around the cylindrical casting near the upper end, leaving a sufficient length projecting above it to make four or five rings. After it has been thus secured, the upper end is faced off, releasing the weld at this point, but the cylinder remains closed because of the band and the weld at the bottom.

The rings are now parted off successively by means of a right-angle parting tool held in the turret of the ma-

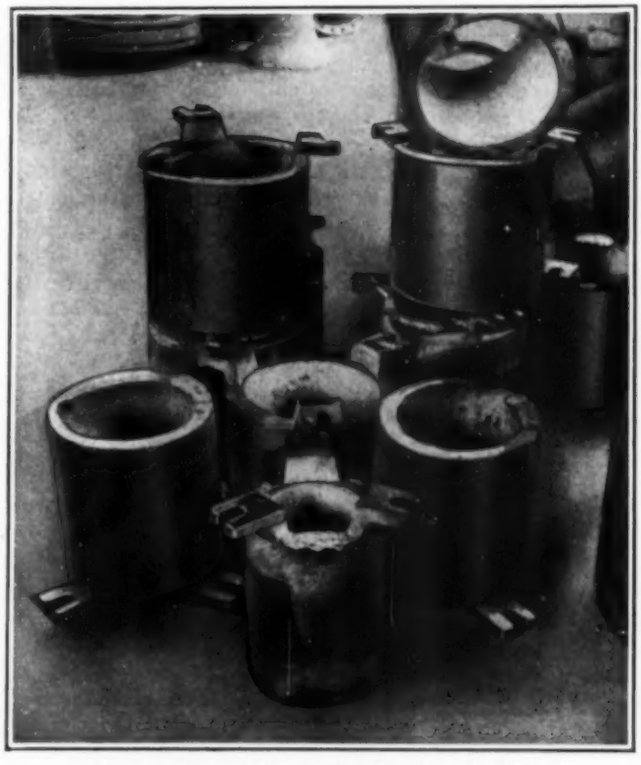


Fig. 1—Pot castings split, closed and welded

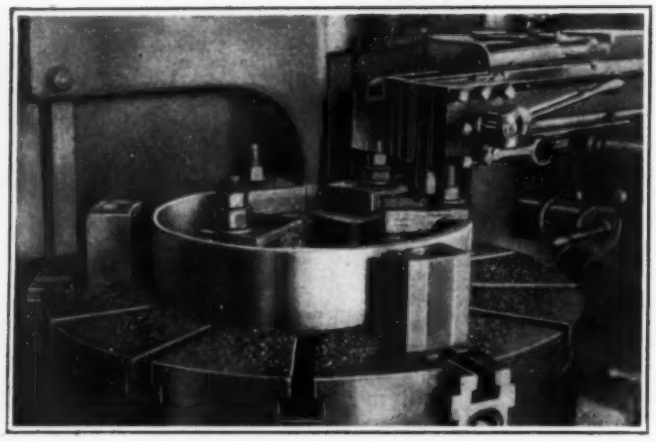


Fig. 2—Turning rings for main pistons

chine and working from the inside of the cylinder, each ring, of course, springing open as soon as it is released by the tool cutting through the wall. As the tool in its successive cuts nears the place where the clamping band surrounds the casting, the band is driven down with a hammer and a block of wood, this procedure being repeated from time to time as the work progresses.

When nearly down to the shoulder left by the outside turning tool, the band may be removed entirely and the bottom weld, supplemented by the hold of the clamping bolts by which the casting is secured to the table, depended upon to retain what is left of the cylinder while the few remaining rings are parted off.

Large rings for the main pistons are made in the same machine but in a different way. The pots are roughbored and turned and the rings parted off before the gap is cut; the latter being cut in each ring separately. A stack of the rings equal in height to the chuck jaws to be seen in Fig. 2 is placed in the chuck and the jaws are closed upon it, springing the rings together until the ends of the gap meet.

The clamps to be seen inside the stack of rings are secured by their bolts on the *outside* of the stack, holding the rings by end pressure while a cut is run through the bore. The clamps are then transferred one at a time to the inside of the stack, as here shown, each clamp being firmly tightened in its place before another is loosed.

When all the clamps have been transferred, the chuck jaws may be run back to clear the turning tool. The end pressure imposed by the clamps will hold the rings securely closed while the turning tool reduces them to finish diameter.

Increasing the Usefulness of the Arbor Press

By Donald A. Hampson

The conventional arbor press could be made much more useful by drilling a few holes in the plate. A press of No. 3 size, for instance, has an arbor plate with four slots in it, to take arbors from 1 to 2½ in. By swiveling the plate, any of these slots can be brought under the ram.

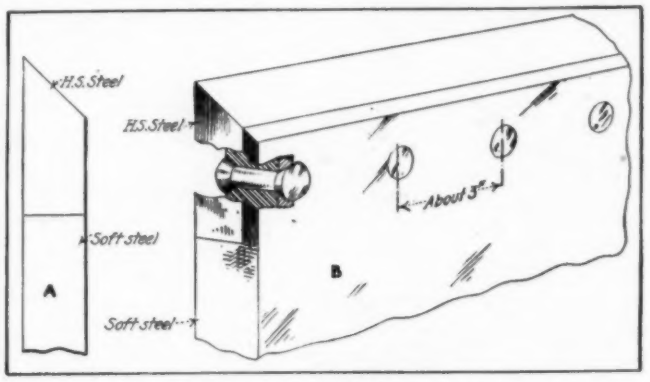
In use, arbors smaller than 1 in. are handled at the smallest slot. Sometimes the hub of the work piece is large enough to span the slot, while at other times it is necessary to employ a pair of cross pieces to span the gap, or to hunt up an odd piece of iron or steel for the purpose. But, regardless of the makeshift employed, the operation is time consuming as well as more or less detrimental to the work or the arbor.

By drilling holes in the solid metal of the plate between the slots, additional positions are provided. There is ample metal there, and the surface is never used for anything else. The holes do not weaken the plate for its originally conceived purpose. Three holes, say $\frac{5}{16}$, $\frac{9}{16}$ and $\frac{13}{16}$ in., will take care of arbors from $\frac{1}{4}$ up to $\frac{3}{4}$ in. The amount of time saved, and the convenience, would not be believed until tried. The metal around the holes gives a more complete support for the work than does the metal on the sides of the slots and, for that reason, the kink is particularly valuable on small and delicate work.

Stronger Blades for the Centerless Grinder

By H. J. Gustav Kopsch

The blades on our Cincinnati centerless grinder were made by brazing a strip of high-speed steel on to a soft-steel base, the brazing making a buttjoint, as shown at



The original, and the improved blade

A. To make stronger blades, I rabbeted the soft-steel base as shown at *B*, thus obtaining more than twice the surface for the spelter to connect the parts and making a backing for the high-speed steel.

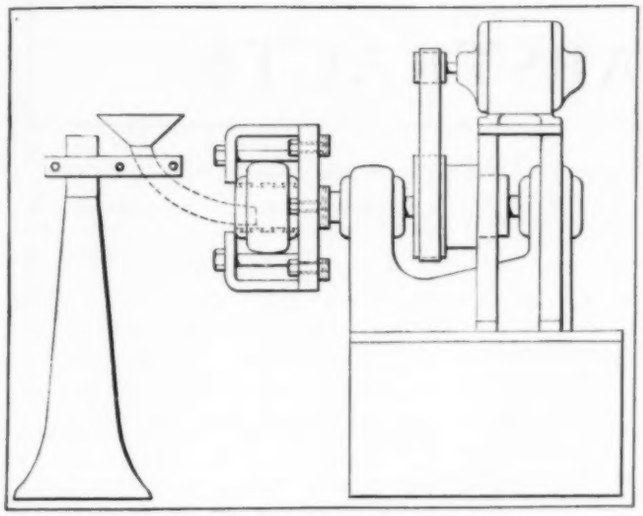
The man who did the brazing went me one better and put in a row of $\frac{3}{16}$-in. rivets on about 3-in. centers, mainly to prevent the parts from shifting during the brazing operation. While the blades are much stronger than the original ones, the extra cost is very small. After the brazing, the blades were ground all over.

A Centrifugal Babbitting-Machine

By P. H. Pearson

The illustration shows a centrifugal babbitting-machine made from the headstock of an old, belt-driven lathe that was doomed for the scrap pile.

The headstock and a section of the bed were set into a cement foundation to prevent excessive vibration. Supports were attached to the bed and the motor was mounted on top of them, directly over the cone pulleys. A babbited faceplate with hinged bolts attached was mounted on the spindle and a plate adaptable to various sizes of bearings was attached to the faceplate. A funnel attached to a substantial support was set in front of the bearing to be babbitted, with the nozzle entering the bore of the bearing. The bearing and funnel were heated to prevent chilling the metal. A guard placed over the bear-



An improvised babbitting machine

ing and the faceplate prevented the hot metal from flying when the machine was in motion. The metal is poured through the funnel, and centrifugal force throws it to the wall of the bearing, eliminating blow holes and making a solid lining.

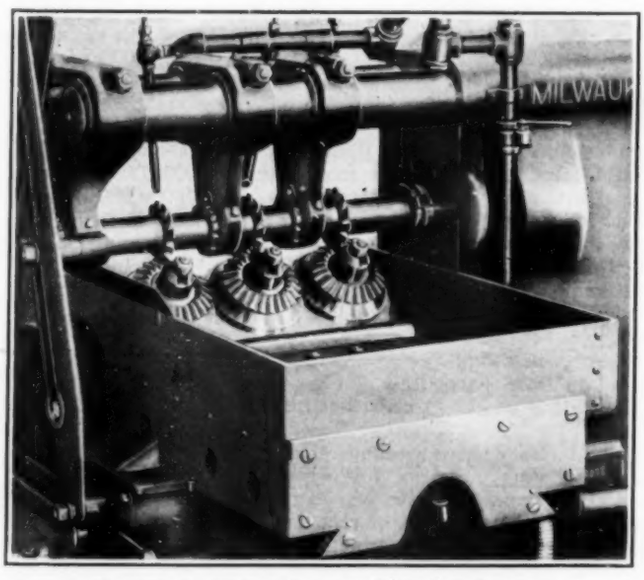
Production Fixture for Roughing Bevel Gears

By George H. Feltner

By means of a special automatic fixture and feeding drum, as shown in the illustration, three, 4-pitch 1¾-in. face gears, having 24 teeth, are roughed out in an elapsed floor-to-floor time of 6 min., or 2 min. each. The table and the saddle have been supplanted by a special attachment carrying a large drum cam that brings the work quickly in engagement with the cutters, slows the feed at the commencement of the cut, and engages the rapid return after the cut has been completed. The gears are automatically indexed on the return stroke, and the index is locked on the next advance stroke.

The cutters used are ordinary roughing cutters, 5 in. in diameter, although the faces of their teeth are ground right- and left-hand, alternatively. By grinding the teeth in this manner it is possible to increase the feed 100 per cent, eliminating chatter and making a better finish than was possible by using cutters having each tooth cutting on both sides. The gears are made of chrome-nickel steel.

The drive to the drum cam is taken from the feed box of the machine through a shaft having universal joints. A feature of the fixture is the reversible three-spindle, work-holding head that may be removed as a unit and replaced with another for a different sized gear. The triple head is made in a unit and is attached to the top of the sliding fixture. Intermediate arbor supports are located between the cutters. The operation is handled in a No. 3 heavy Milwaukee milling machine.

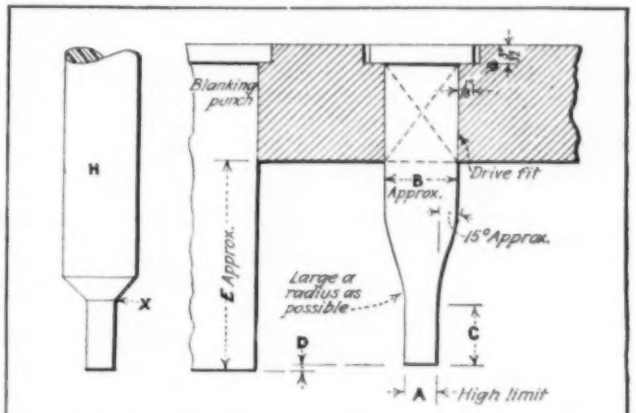


Automatic fixture for roughing bevel gears

Punch Design

By Charles E. Kirkbride

The dimensions in the accompanying table were compiled by a tool designer who has had years of experience in the design of punches and dies. They represent, from a practical standpoint, the best design for piercing



A	B	C	D	Thickness of Stock	E
Up to 1/16" inc.	1/4"	1/8"	1/64	Up to 1/64" inc.	1"
1/16" to 5/32"	1/4"	5/32"	"	1/64" to 1/32"	"
3/32" to 1/8"	5/16"	3/16"	1/32"	1/32" to 1/16"	1 1/8"
1/8" to 5/32"	3/8"	7/32"	"	1/16" to 3/32"	"
5/32" to 3/16"	7/16"	1/4"	"	3/32" to 1/8"	1 1/4"
3/16" to 1/4"	7/16"	5/16"	1/16"	1/8" to 1/32"	"
1/4" to 1/2"	1/2"	7/16"	"	1/32" to 1/16"	"

Table of dimensions for piercing punches

punches that are to be used in production work, turning out thousands of pieces daily.

Many designers are prone to indicate on their drawings a punch similar to that illustrated at *H*. The percentage of breakage in punches of this design, as compared with the design indicated in the table, has been found to be exceedingly high, breakage usually occurring at the point mark *X*.

Dimension *D*, indicated in the table, represents the distance that the blanking punch should be in advance of the piercing punch, and it has been determined that close adherence to this dimension will result in considerably longer life of the piercing punch.

· TECHNICAL · ABSTRACTS ·

Manufacturing Brass Forgings

Brass forging is not accomplished as easily as the forging of iron. The temperature must not be too high, as the metal might melt or oxidize badly. Also, the brass mixture must be within the forging range, or it will crack when subjected to forging operations. The forging temperature is about 1,250 to 1,300 deg. F., and the mixtures used contain: Copper, 56 to 63 per cent; lead, 0 to 3 per cent; tin, 0 to 3 per cent; iron, 0 to 3 per cent; and zinc the remainder. Mixtures containing 87 to 100 per cent copper, which include aluminum bronze and pure copper, also are forged. With a copper content below 56 per cent, the brass is brittle, and those containing from 63 to 86 per cent are usually hard, causing them to crack and also develop hot-shortness.

Although some brass forging had been done in Europe before its exploitation in this country during the war, there seems to be no record of when brass forging was first introduced. The advantages of brass forging over turning the work from bar stock are in the saving of metal, the lowering of machine work by proper die design, a greater density, freedom from porosity, additional strength imparted to the metal, and, finally, a saving in polishing operations.

Demand for small precision parts for munitions during the war did much in developing the progress of brass forging. The present plant of the Mueller Brass Company, Port Huron, Mich., was started in 1917, but at the close of the war, the firm turned its attention to peace-time pursuits, and spent much time and money in adapting and creating a market for brass forgings in industry. Now, the firm turns out brass forging products valued at $6,000,000 each year.

Forgings at the Mueller Company are manufactured from blanks drawn from extruded dies. The plant has fifteen electric furnaces available for producing billets. Each furnace can produce 2,475 lb. per heat, and the furnaces operate 24 hours a day. The billets are heated to a temperature of 1,300 to 1,350 deg. F., and are then extruded into rods in an extrusion press operating under 5,000 lb. per sq.in. pressure.

Brass forging is accomplished on drop hammers. Some types of forgings require a slower and longer pressure to form them, and this is done on crank presses. In forging, an excess of metal is necessary, so that the die is completely filled. This excess metal is squeezed out around the edges of the die, and forms a flashing, or fin, which must be removed. Forgings require little or no machining other than the trimming of the flash. The surface on the product from the forging operation is smooth, and only needs a slight pickling in nitric acid to bring out the color. —Edwin Bremer, *Iron Trade Review*, Dec. 29.

Grinding Twist Drills

A great amount of trouble can be saved by users of twist drills if a little more care is exercised regarding the proper grinding of the points. Improper point grinding is not only costly, but efficient results cannot be obtained from drills so ground. The standard drill point has an included angle of 118 deg., lip clearance 12 to 15 deg., and the angle or chisel point is 130 deg.

Cutting lips not of a uniform length will drill a hole oversize and cause excessive wear on the margin of one lip. Insufficient lip clearance will cause the drill to rub on the heel, or back edge, of the cutting lip and the drill will not cut; causing undue strain on the feeding mechanism of the drilling machine and often breaking the mechanism or splitting the drill up the center of the web. Too much clearance will weaken the drill at its cutting edges, causing same to crumble when entering work.—W. M. Gladding, works manager, Morse Twist Drill and Machine Co., *Abrasive Industry*, January, 1928.

Testing Sheet Steel for Drawing

There are various methods of testing the so-called "temper," or drawing quality, of sheet steel, and therefore the method selected in any individual case should be based upon the requirements of the particular job. While the scleroscope test is used to a certain extent, its figures indicate only the resilience of the sheet and will show extreme variations, due to different surface finishes, even though such sheets may possess the same drawing characteristics.

On heavy gage sheet steel the Brinell hardness test is sometimes used. While no definite data are available, it appears that Brinell readings on sheets from 18 to 20 gage are of doubtful value. This is concluded from the fact that a single sheet is excessively crushed in testing.

The Rockwell test has its advantage in that the minor load, which is applied first, breaks through the oxide, or scale, and allows the major load to show a closer "true" hardness, or "temper." However, the results obtained may vary according to the factor of time that elapses between full application of the load and its release.

The Erickson and Olsen ductility machines have advantages, showing not only the depth of draw at the point of fracture, but to a certain extent the surface that may be expected on forms and shapes having sharp radii.—*Forging-Stamping-Heat-Treating*, Nov., 1927.

The World's Mechanical Industries

Excluding automotive industries, the world's pre-war annual capacity for mechanical products was estimated at $3,270,000,000. Of these very close to 50 per cent was the share of the United States, occupying the first place among all nations in that respect. Germany came next with 20.6 per cent of the total. Then came Great Britain with 11.8 per cent. The next four countries were: Russia, 3.6 per cent; old Austria-Hungary, 3.4 per cent; Canada, 2.5 per cent; and France, 1.9 per cent. All other countries had only 6.3 per cent to divide amongst themselves.

After the world war, during the period from 1913 to 1925, the estimated increase in the capacity for mechanical products was equal to 46.5 per cent, bringing the total capacity to $4,790,000,000, but of these only 74 per cent, or $3,550,000,000, are to be considered as actually produced.

Again, the United States is in the lead with a production equal now to 57.5 per cent of the total, but the second country is now Great Britain with its share of almost one-sixth of the world's production. Germany, with its partially crippled industry, occupies the third place. After that we have: Canada, about 3.5 per cent; France, about 3 per cent; Russia, about 2 per cent; and Italy, about 1 per cent.

What is the nature of those of the products of the mechanical industries which are now the most bought by the various countries? To answer this question we will consider the exports of the three leading countries which are responsible for 84 per cent of the world's export in this kind of product, namely of the United States, Great Britain and Germany. In 1925 these three countries exported, at pre-war valuation, $85,000,000 worth of textile machinery, $63,000,000 worth of agricultural machinery, $52,000,000 of motors, $38,000,000 of machine tools, and $25,000,000 of office machines. In 1913 the corresponding figures for these items were: $96,000,000 worth of textile machinery, $49,000,000 of agricultural machinery, $38,000,000 of motors, $24,000,000 of machine tools, and $12,000,000 worth of office machines. The export of textile machinery has increased in the following countries as compared to pre-war times: United States, 275 per cent; France, 1,050 per cent; Switzerland, 75 per cent, and Italy 200 per cent. The machine-tool export has increased in France, 800 per cent; Switzerland, 400 per cent; Sweden, 40 per cent. The exports of the following machines have also increased: Printing machinery, mining equipment, sugar mill equipment, food manufacturing equipment, chemical plant equipment, and sewing machines. —A. Pawlowski, *Le Génie Civil*, Dec. 3.

Activity in the Metal-Working Industries

Conditions Favorable for 1928

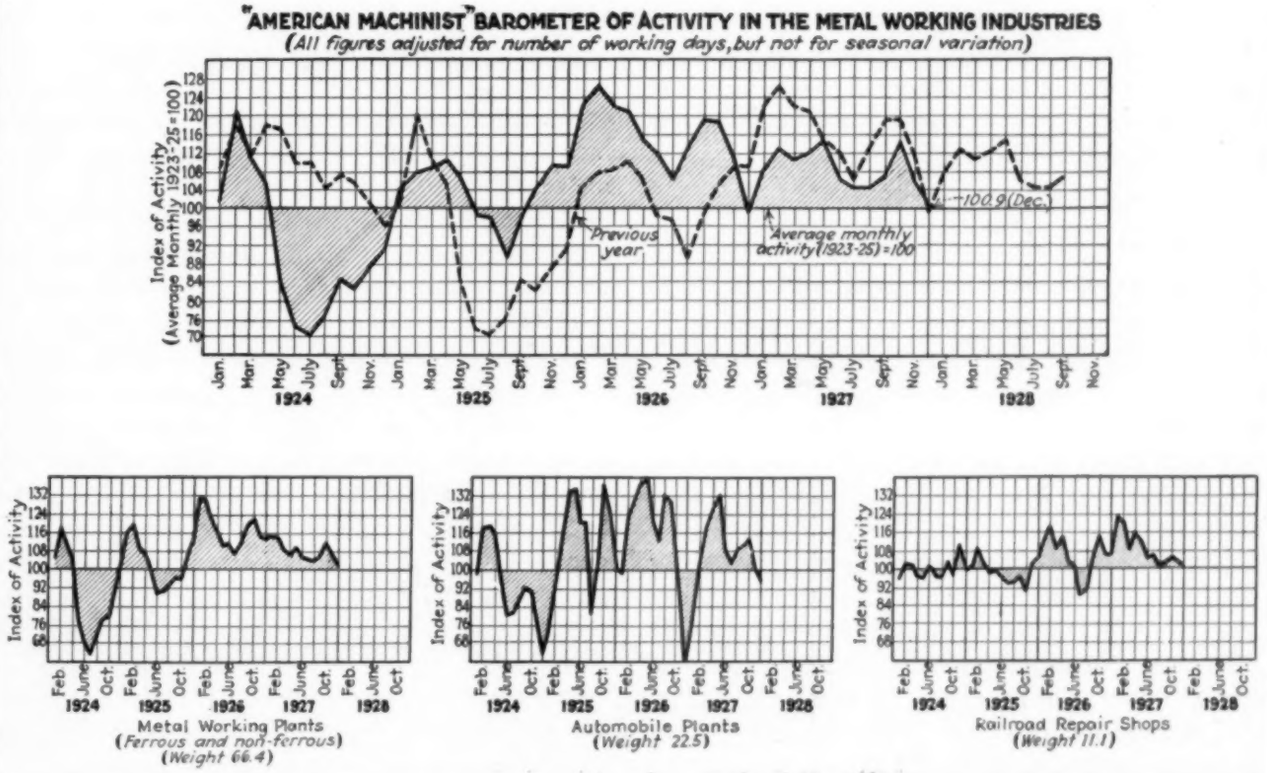
Preliminary reports indicate that the year 1927 closed with the rate of operations in the metal-working industry at the lowest since September, 1926. Preliminary reports last month had indicated that November operations were slightly higher than those of November, 1926, but final reports showed the operations to be slightly below those of the year previous. December operations in the metal-working industry were 4.4 per cent under November, but were 2.4 per cent higher than December of last year.

The index of activity in the metal-working industry based on the consumption of electrical energy stands at 100.9 for December, as compared with 101.6 for November. Comparative indexes of productive activity in these plants referred to the average activity for the period 1923-25 as 100, and adjusted for number of working days, are as follows:

December, 1927	100.9
November, 1927	101.6
October, 1927	106.5
December, 1926	98.7

The year closed with the rate of operations in the ferrous and non-ferrous metal working plants about 7.8 per cent below those of December, 1926. On the other hand, the automobile manufacturing industry while turning out cars and trucks during December at a rate lower than December of last year, still recorded a production of automobile equipment and replacements parts on a plane about 40 per cent higher than that of December, 1926. The manufacture of equipment and replacement parts for the twenty-three million automobiles now operating in this country has assumed an importance equal to, if not greater than, the production of new automobiles and trucks.

Among the favorable economic factors upon the horizon as the year opens are: No inflation of prices; labor well employed; no surface indications of overbuying; no signs of a credit stringency; purchasing power of the farmer materially increased; general construction during the year should be in line with the trend of 1927; automobile construction should be of record proportions; federal tax reduction which will benefit very largely the smaller manufacturing corporations; and Europeans conditions, both political and economic are steadily improving. On the unfavorable side, however should be placed the relatively unsatisfactory earnings by manufacturing corporations during the last half of the past year, and secondly a political year, making possible almost any political hazard.



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Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Price Pressure and Hard Buying

PRICE pressure and "hard buying" are to be abandoned by the purchasing agents of at least one large automobile company according to report. This, according to W. L. Chandler, Secretary and Treasurer of the National Association of Purchasing Agents, "is representative of a new attitude that is being adopted by buyers in many lines. And there is no question but that within reason it is a sound policy."

Such an attitude will do more to make for good business than any one thing we know of. With such a practice in operation, sellers of machinery should have little excuse in not maintaining their list price. Such a procedure, assuming that machines were fairly priced, would make selection depend largely on merit, as it should.

Continuing, Mr. Chandler says, "this policy represents the application of the belief that 'buying right' means buying from the standpoints of fair price, good quality and proper service. It is a reflection of the fact that, in the long run, it is poor business to be a party to a transaction where either side is going to lose money."

That is a sound position and if the various members of the National Association of Purchasing Agents become imbued with its wisdom, it should make for better and more satisfactory business in every way.

Old and New Gear Making Practices

MANUFACTURING practices change as new and better methods are discovered. Old methods are abandoned for those that seem to be better. And yet we frequently find cases where practices that we have laid aside as being not only inefficient, but detrimental, are used in the building of what are apparently high class machines.

A case in point is the running together of gears with an abrasive compound to grind out the irregularities and shape the teeth to match. We discovered some time ago that this was not good practice, that it did not give the best tooth forms, and that it was likely to leave particles of the abrasive embedded in the gears. As a result the practice has been almost entirely abandoned in this country.

On the other hand some of the best known European makers of automobiles still pursue this practice, and believe it to be necessary to secure best results. Certainly their cars bear excellent reputations and apparently stand up in service.

There is little doubt as to our methods being the most thoroughly mechanical and most efficient. But it is just possible that we were a trifle overcautious concerning the ill effects of the practice referred to. If, on the other hand, this overcaution was responsible for improved methods, as seems to have been the case, it is well that we doubted the wisdom of the old method.

Who Steals My Purse

"WHO steals my purse," said Shakespeare, "steals trash" but any theft of such "trash" is not only resented but promptly prosecuted, and the culprit receives scant consideration. The theft, or shall we say appropriation, of ideas is, however, a very different matter, even though they are much more valuable than any purse of modern days.

Engineers who would scorn to touch a penny not their own do not hesitate to appropriate valuable ideas if they can find a way to get over, under or around the patent law. Some large users of machinery, and occasionally an ambitious government purchasing officer, do not even bother to evade patents. The former depend on their large purchasing power to intimidate the patentee against entering suit while the difficulty or securing redress from a governmental department usually prevents legal action in the latter instance.

Regardless of their size, concerns or departments that countenance practices of this kind are undesirable customers. A few law suits to sustain patents even at the risk of losing a few orders, is the only way in which such practices can be curbed. If, in addition to this, other vendors co-operate to the extent of not catering to customers who are guilty of such practice, they would promptly disappear. The sooner all those who furnish the backbone and sinew of manufacturing, and incidentally make possible the large profits of other industries, realize that injury to one is the concern of all, the quicker the situation will be remedied.

This is a matter in which all builders of machines involving patented features should be deeply interested, for their own protection.

Holz "Borescopes"

INSIDE surfaces of long, hollow, metallic bodies such as gun and rifle barrels, compressed gas steel cylinders, metal tubes, hollow shafts and axles, and long borings in castings and the like, can be examined by the "Borescopes," portable optical inspection instruments marketed by Herman A. Holz, 17 Madison Ave., New York, N. Y. The principle on which most of the instruments have been designed and constructed is similar to that utilized for many years in the cystoscope, a medical instrument used for the examination of the interior of the bladder.

A comparatively long metal tube carries the source of electrical illumination and contains a suitable optical system, usually consisting of lenses, prisms, light filters and a focusing eyepiece. The length of the instrument is determined by individual requirements. The main function of the special optical system provided is to create a panoramic image in natural colors with maximum contrasts, so that slight structural differences are clearly brought out and may be easily observed.

The ratio between the diameter and length of the Borescope is limited to about 1 to 100. The maximum length of the instrument developed so far is about 17 ft. If the body to be inspected is open at both ends, the instrument length required is naturally only one-half of the body, since the instrument can be introduced at either end. If the hollow space is a blind hole, some types of Borescopes are available to permit an examination of the bottom surface in addition to that of the walls. Most of the instruments have been constructed to meet special conditions, but a few types, described below, have been standardized.

Type No. NA Borescope, shown in Fig. 1, will just clear a 1½-in. bore. By inserting it successively at either end of the tube, a maximum length of 25 ft. can be brought under observation. This instrument is provided with external electric leads for the lamp. The usual practice is to take the leads out at the end of the hole opposite to that used for observation, and to pull the leads back and forth as the hole is traversed.

With blind holes, the leads must be brought out in a direction parallel with the instrument and this manipulation reduces the minimum diameter of blind holes that can be expected to 1.73 in., with a maximum length of 13 ft. As this narrow-diameter instrument carries a narrow field, it is not well suited for the examination of the interior walls of large bored holes, such as large-sized guns. Because the optical field is very small, the instrument has to be oriented in different directions many times in order to completely cover the 360 deg. for the entire bore.

Type No. WA Borescope, shown in Fig. 2, covers the relatively wide angle of 120 deg. of the objective. The result is that the eye receives an annular image, but includes the entire 360 deg. of the bore. Owing to the effect of seeing the bore magnified around the periphery of this annular image, the effect on the eye is as though the interior bore were drawn into the shape of a horn. This type can be used in the examination of holes 2½ in. or larger in diameter, and up to 17 ft. deep. The main steel tube is 2.48 in. in diameter, and is over 17 ft. long. It carries a focussing eye-piece at one end and six triple lenses at the other. Eight lamps, each consuming 3 watts at 6 to 7 volts, are used for the illumination. The electrical leads are inside the tube so that they do not interfere with the operation of the instrument.

This type is supplied with a detachable prism that allows local defects at right angles to the instrument end to be examined in detail. This type can also be fitted with a photographic attachment consisting of a metal plate-holder at the focal plane of the eye-piece of the instrument.

In Fig. 3 is shown the type "Rifle FS" Borescope, which was especially developed for examining the bore of rifle barrels. This particular type is usually supplied with a 5 or 7 mm. outside diameter and a length of 60 cm., or about 24 in. As the illus-

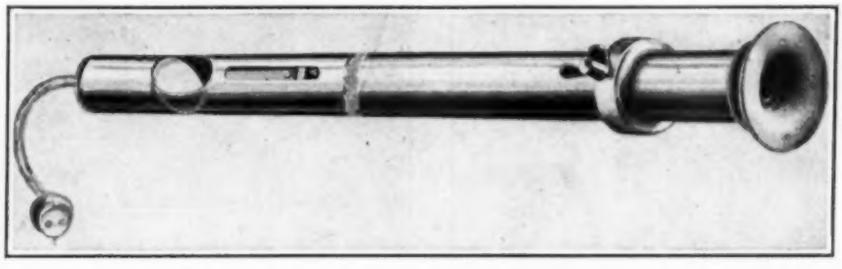


Fig. 1—Holz Type No. NA "Borescope"

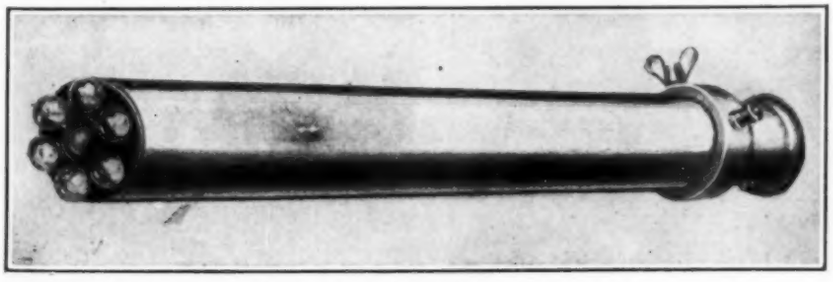


Fig. 2—Type No. WA Borescope

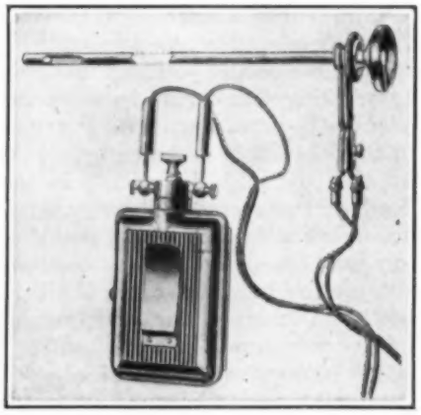


Fig. 3—Type "Rifle FS" Borescope

tration shows, internal leads are provided for the special lamp located at the tip of the tube. The long tube is introduced in the bore to be examined, and the operator looks into the eyepiece and holds the instrument by the handle carrying the battery leads. A rheostat is provided on the battery case to adjust the intensity of the lamp. The instrument produces a clear and distinct panoramic image that can be photographed.

This rifle type can be made in several sizes. The maximum length is about 15 ft. and the usual diameter is 1/100 of the length. This limitation is based upon the optical system used. These FS Borescopes contain an optical system by which internal reflections are eliminated, and images in natural colors are obtained. The yellow and red rays from the incandescent lamp are filtered out, and maximum contrast is produced.

Hammond Special Multiple-Spindle Automatic Drilling Machine

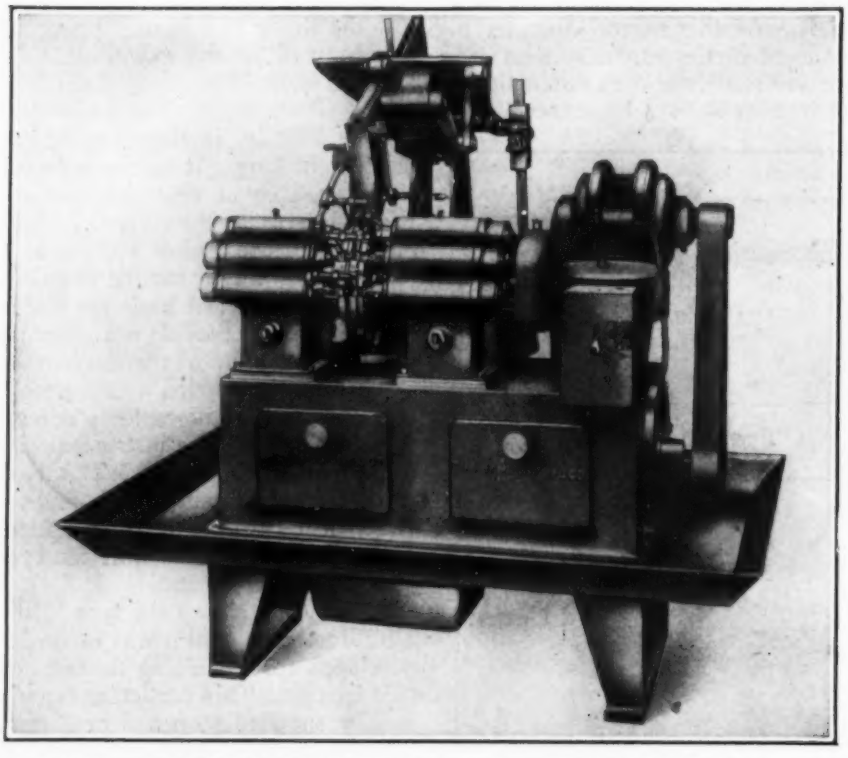
RECENTLY the Hammond Manufacturing Company, Cleveland, Ohio, developed a special multiple-spindle automatic drilling machine for drilling $\frac{1}{8}$-in. cross holes in the heads of $\frac{1}{2}$-in. cap screws. Previous to this operation, a center hole $\frac{1}{4}$-in. in diameter must be drilled in the head of the screw. Three spindles are mounted in each of the two sliding heads, and the feed is obtained from cams mounted on a shaft in the bed of the machine, and through levers to the heads.

The screws are automatically fed from a hopper to bushings in an indexing disk mounted in a vertical position. In the first drilling position, two sides are drilled. The drills are then withdrawn, and as the wheel is indexed to the second position, the screw is indexed one-sixth of a turn for the second drilling operation, after which the screw is again indexed and carried to the third spindle where the final drilling operation is performed. The screw is then ejected. With six spindles working as described, one completely drilled screw is ejected at each indexing of the disk.

At each drilling station there is a device that holds the screw heads firmly in position while the drilling operations are performed. With $\frac{1}{2}$-in. cap screws made of S.A.E. 3130 steel, the production is 14 screws, or 84 holes per minute.

The machine is designed to allow for various arrangements of the head, spindles, and drilling fixtures to suit requirements. The main drive shaft at the rear of the machine, the intermediate shaft, spindle, idlers, and worm shafts, are all mounted on ball bearings, while the camshaft and the shaft carrying the work-holding disk both run in bronze bearings of ample size.

A 2-hp. motor operating at 1,200 r.p.m. supplies power for driving the machine.



Hammond Special Multiple-Spindle Automatic Drilling Machine

Van Dorn Electric Socket Wrench

Separate driving spindles for forward and backward rotation of socket wrenches to provide positive drive in either direction under full power and speed are featured in the No. E. W.-100 electric socket wrench recently developed by the Van Dorn Electric Tool Company, Cleveland, Ohio.

As can be seen in the illustration, this electric wrench is similar in principle to a hand wrench for final setting or breaking loose of nuts with the addition of electric motor power for spinning them on or off. A multiple-disk clutch operated by a slight pressure on a lever in the handle engages the motor, which transmits its power through a worm gear to the driving spindles. When the clutch lever is released, the worm and gear automatically lock the driving spindle, thus producing a hand

Van Dorn Electric Socket Wrench in operation

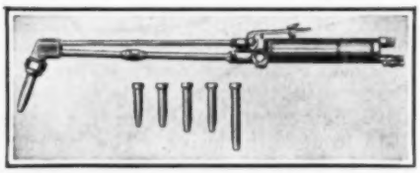
wrench for the final setting of the nuts.

Practically any size of nut, bolt, or cap screw that runs free can be driven on with this socket wrench. The unit is particularly recommended, however, for either hexagon or square nuts not exceeding $1\frac{5}{8}$ in. across the flats. A complete set includes an electric wrench, one 3-in. socket adapter, one 11-in. socket adapter, and nine hardened alloy steel sockets of $\frac{7}{16}$, $\frac{1}{2}$, $\frac{9}{16}$, $\frac{5}{8}$, $1\frac{1}{16}$, $\frac{3}{4}$, $\frac{7}{8}$ and $1\frac{1}{16}$ in., hexagon, and $\frac{9}{16}$ in., square, all contained in a metal box.

The over-all length of the unit is 16 in., and the over-all width 10 in. The weight is 14 lb. The unit is regularly furnished for use on 110- and 220-volt circuits.

Milburn Type RI Lightweight Combination Cutting and Welding Torch

The type RI combination torch is similar to the type NI combination cutting and welding torch, but is lighter in weight. It is made by the Alexander Milburn Company, 1416



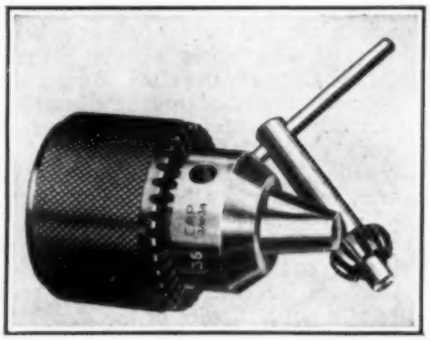
Milburn Type RI Combination Cutting and Welding Torch

West Baltimore St., Baltimore, Md. By interchanging the tips the operator can either cut or weld with the torch. It is made to operate with oxygen and acetylene, oxygen and hydrogen, or other gases. It will weld the lightest or heaviest metals and will cut metals up to 12 in. in thickness. Its weight is 40 ounces.

The torch has two gas tubes made of stainless steel. The high pressure cutting oxygen thumb button remains fixed in either open or closed position without sustained pressure from the thumb. The torch head, made of forged bronze, as well as the valves have high tensile strength, and are designed for severe service and continuous operation. All the valves are readily accessible. Among other features are good balance, ease of operation, and the supermixing of the gases so that a neutral, uniform flame results. It is claimed that the nose of the torch can be put into the molten metal without stopping its operation.

Jacobs Model 36 Drill Chuck

An addition has been made by the Jacobs Manufacturing Company, Hartford, Conn., to its line of plain-bearing, keyed drill chucks. The new chuck, which has a capacity to hold drills from $\frac{3}{16}$ to $\frac{3}{4}$ in. in diameter, is to be known as the No. 36 model. It is designed especially for use in connection with portable tools, in which



Jacobs Model 36 Drill Chuck

field it has hitherto been necessary to use taper-shanked drills for holes $\frac{5}{8}$ in. in diameter and over.

The weight of the chuck is 2 lb., 12 oz., which is but little more than that of previous chucks of $\frac{1}{2}$-in. and $\frac{5}{8}$-in. capacity. By means of this chuck it is possible to handle in portable tools not only straight-shank drills, but taps, reamers, and the spindles of honing devices.

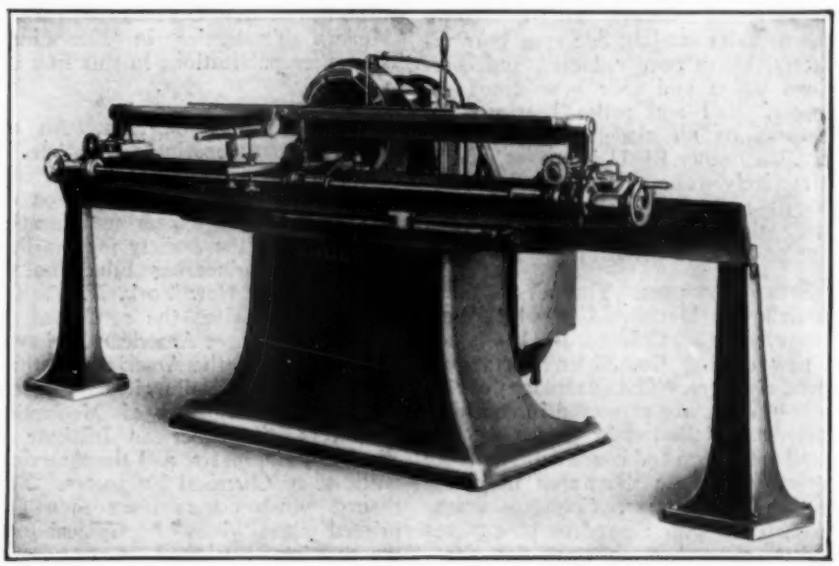
Rogers Type R Full-Automatic Knife Grinder

Chipper, veneer, paper, and shear blades up to 146 in. in length can be accurately and speedily ground on this Type R full automatic sectional-wheel grinder recently placed on the market by Samuel C. Rogers & Company, 191 Dutton Ave., Buffalo, N. Y.

The grinding is performed by a 14-in. sectional grinding wheel having eight segments mounted on a strong steel chuck with means for readily adjusting and replacing the segments. In conjunction with an improved water attachment, spring cross feed, and the type of grinding wheel, much faster grinding without danger of burning the knives is claimed.

The spindle, which may be mounted on ball bearings, if desired, is driven direct from a 5-hp. motor built into the base and driving through a leather belt. The starter is also built integral with the machine.

Other features of the unit are the heavy yoke bottom supports with adjusting nut to eliminate vibration, and double ratchet feeding with automatic stop. The machine is made in eight sizes numbered 1 to 8, and ranging from 76 to 144 in. in capacity. The over-all floor spaces vary from 4 ft. x 14 ft. 2 in. to 4 x 26 ft., and the domestic shipping weights vary from 2,450 to 3,900 pounds.



Rogers Type R Full-Automatic Knife Grinder

Trade Catalogs

GEAR TOOTH BURNISHING MACHINE. The Fellows Gear Shaper Co., Springfield, Vt., has published a small booklet describing a machine for burnishing gear-teeth after finish cutting. In the introduction, the function of burnishing and its advantages are explained. Numerous photographs are used in conjunction with the text to explain the working of the machine. The publication contains twenty 6x9-in. pages.

HYDRAULIC PUMPS AND MOTORS. The American Fluid Motors Co., Philadelphia, Pa., has prepared a catalog on Hele-Shaw hydraulic pumps and motors for the application of high-pressure hydraulic power. The pump, fluid motor, and fluid transmission are first described in a general way, after which specific applications are discussed, such as: presses of all kinds, broaching machines, testing machines, marine steering gear and miscellaneous applications. A detailed analysis of the design and operation of the pump and fluid motor is then given with the aid of cross-sectional views, followed by complete specifications. The catalog contains 32 8½x11-in. pages and is well illustrated throughout.

REAMERS. The Manchester Tool Co., 61 Adams St., Manchester, Conn., has available for distribution, two small circulars describing its "Rapid Cut" taper-pin machine reamers, spiral-flute reamers and helical taper-pin reamers. The spiral-flute taper reamers were recently described in this publication. Both circulars are illustrated.

SPEED REDUCERS. The Albaugh-Dover Manufacturing Co., 100 Marshall Blvd., Chicago, Ill., has published Bulletin A on its speed reducers. This company's line includes straight-line spur gear reducers, worm gear reducers, and combined worm and spur gear speed reducers. Ball and roller bearings are featured on all models. The catalog contains twenty 8½x11-in. pages, and is attractively arranged throughout. Photographs and cross-sectional views enhance the text. Specifications of each type of unit are given.

SPEED REDUCERS. The W. A. Jones Foundry & Machine Co., 4401 West Roosevelt Road, Chicago, Ill., has issued a new catalog No. 35 on worm gear speed reducers. The advantages of this type of drive are presented in considerable detail, followed by presentation of details of design and construction. Many typical units are illustrated in cross-section for clearness. Complete dimensional data with regard to base plates and the units themselves are also given. Tabulations of the horsepower capacity is quite complete and incorporates heat ratings for continuous operation for both the medium-duty and the heavy-duty types. Many pages are devoted to illustrating typical applications of worm gear drives. The entire catalog is pleasingly arranged and contains 56 8½x11-in. pages.

Pamphlets Received

ELECTRIC HEATING AND ELECTRIC WELDING. A paper under the above title presented by C. L. Ipsen, engineer, industrial heating and welding department, General Electric Co., at the 43rd annual meeting of the Association of Edison Illuminating Companies, held at Colorado Springs last September, is now available in pamphlet form. A comparison is made of the relative cost of electricity and fuel for industrial heating, and experiences of the General Electric Company are cited. Among the apparatus described are steel melting and treating furnaces, furnaces for other metals, as well as for enameling, glass annealing, baking of metal finishes and cores, bread, and other food products, and miscellaneous apparatus. Instances of substitution of electric welding for riveting and the substitution of welded structures for cast iron and cast steel are also cited. Copies of the pamphlet, designated as GED-128, may be obtained from the General Electric Co., Schenectady, New York.

EMPLOYEE MAGAZINES. The Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y., has issued bulletin No. 4 of a series of reports based on proceedings of the Employee Magazine Editors Conference held in New York last year. This pamphlet covers an address by Dr. Lee Galloway, chairman of the board, Ronald Press Co., entitled "Modern Tendencies in Education." Two other publications in this line are to follow.

ENGINEERING EDUCATION. An appraisal of engineering education by members of five professional societies is presented in Bulletin No. 13 on the Investigation of Engineering Education just issued by the Society for the Promotion of Engineering Education, 29 West 39th St., New York, N. Y. The bulletin summarizes the results of inquiries made by the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Chemical Engineers. This report, which covers more than fifty printed pages, gives in graphical form the reaction of selected groups of each of these societies to a series of questions relating to the adequacy of present day engineering education in its various phases. The report indicates that schools should concern themselves largely with underlying principles and that the program of the engineering colleges should be built upon broad lines from humanistic, scientific, and technological materials of a basic character. Specialization should follow after graduation.

FOREIGN TRADE PROMOTION. The Foreign Commerce Department, Chamber of Commerce of the United States, has available for distribution a pamphlet on the above subject dealing with the work being done in the field of foreign commerce by trade associations and Chambers of Commerce. This publication contains forty-eight 6x9-in. pages. Copies may be obtained from the Washington office of the U. S. Chamber of Commerce.

GRINDING WHEELS. The first revision of simplified practice recommendation No. 45 on grinding wheels is available. As is usual in these publications, a list of acceptors of the recommendation is given, followed by the recommendation itself (in this case presented in the form of sixteen tables illustrated graphically) and a summary of grinding wheel simplification. The publication may be obtained from the Government Printing Office, Washington, D. C., for 10 cents.

INCOME STATISTICS. The preliminary report on "Statistics of Income" compiled under the direction of the Commissioner of Internal Revenue, Treasury Department, is now available. Comparative figures are given for the years 1913 to 1926, inclusive. The information is in tabular form and compares such items as distribution by income classes, sources of income, and deductions in individual returns, the number of returns by income classes and the like. Some interesting results have been obtained. A copy of the pamphlet may be obtained from the Government Printing Office, Washington, D. C.

SIMPLIFIED SOCKET WRENCH TABLE. The Husky Wrench Co., Milwaukee, Wis., has available for distribution, a table of sizes of openings corresponding to nominal socket wrench sizes of U. S., S. A. E., and American Standards. The sizes of openings corresponding to square sockets are also given.

"THE VICTOR GLADIATOR." The Victor Saw Works, Inc., Middletown, N. Y., has started a house organ under the above title. No. 1, Vol. 1, is 4½x6 in. in size and contains sixteen pages. The chief article is entitled "Cutting the Cost of Cutting." Comments on subjects of general interest are also included, such as the new Ford car, and the recent transatlantic flights. Some space is also given to humorous articles.

NEWS OF THE WEEK

Greater Value for Purchaser's Dollar Is Feature of 1928 Motor Car

Higher speed, more comfort and bright colors noted

NO ONE who recalls the first annual automobile show, and who has seen the changes each succeeding year, the first impression of 1928 is the long, low appearance of the average car, in marked contrast to the high vehicle of "horseless carriage" days. Engine details have received careful attention. Bearings on crankshafts are increasing in number and size. Cylinder bore, stroke and compression are increasing and stock cars of 100 hp. or more are neither uncommon nor high in price as compared with a few years ago. Almost without exception and regardless of price, the horsepower and speed have been increased over last year. Even the smallest of cars are now rated at 60 miles per hour or over.

MECHANICAL IMPROVEMENTS

Semi-floating rear axles predominate. There is a tendency to a wider tread so as to increase the width of the rear seat cushion. Four wheel brakes are now universal, with the internal brake predominating. Hydraulic brakes now have automatic compensation for expansion and contraction of liquid. Some mechanical brakes are now using an enclosed cable, while the vacuum brake has been adopted by one builder. Disk, wire and wood wheels are being made to inter-change on the same hubs and are carefully balanced. This and frame reinforcement are helping to reduce shimmying. Steering gear ratios are higher and columns are adjustable, as are the driving seats in some cases.

When one sees the accessories that are now regular equipment even on cheap cars, it is hard to realize that windshields and head lamps were once extras. Shock absorbers of some sort, with hydraulic types much in evidence, are seen on many cars. Four-wheel brakes are now universal, even on the lowest priced cars. There is a tendency toward slightly larger wheels and tires on the smaller cars, 29x4.40 in. seemingly giving way to 30x4.50 in. Tire and wheel sizes, however, show no trend toward standardization.

Taller and slimmer radiators are the vogue, with short filling caps that give an appearance that is both foreign and pleasing. Radiator cap ornaments, when used, seem to be of more simple design, which is an improvement.

Air cleaning, oil filtering and gasoline straining devices have come to be almost universal equipment. Grease cups have largely disappeared, giving place to some sort of high pressure oil or grease gun connection. Mechanical lubrication of chassis bearings and connections grows slowly as does mechanical gasoline feed to the carbureter, although both are in evidence on some cars.

A trend toward deeper frames seems evident and kickups at the rear seem higher, but road clearance has been increased on at least one car. The innovation in bodies and their mounting is found in the new Dodge small six. The body is all steel with double walls. Instead of the usual sill at the bottom, the sides of the body are fastened directly to the frame, the steel floor boards resting on the frame itself.

Eight-in-line cars are on the increase, some of them getting down almost into the thousand dollar class. Sixes predominate, however, and are made in many wheelbases, powers and prices. But few four-cylinder cars remain, although those that have survived have been so balanced as to run 60 miles per hour, or better, without undue vibration. And with improvements and lower prices, the automobile dollar never purchased so much transportation, beauty or comfort.

It is difficult to mention any outstanding mechanical development, although there is little doubt that all cars have been so improved as to be of greater value than ever. The greatest change in appearance is due to the adoption of high, narrow radiators on many cars. Body lines, bright colors, and attractive accessories appeal to the prospective buyer. Pedal arrangements, however, are not always convenient for the driver. Steering wheels and their attachments are strikingly similar. The use of rubber blocks on spring ends seems to be increasing. Air cleaners, oil filters and crankcase ventilators are almost universal but there seems to be little further tendency toward oil rectifiers. Hoods continue to grow to unnecessary heights and widths, and with the lowered seats, have decreased road vision to what seems to be near the danger point.

The forty-three makes of cars exhibited are Auburn, Buick, Cadillac, Chandler, Chevrolet, Chrysler, Cunningham, Diana, Dodge, duPont, Durant, Elcar, Erskine, Essex, Falcon, Franklin, Gardner, Graham-Paige, Hudson, Hupmobile, Jordan, Kissel, LaSalle, Lincoln, Locomobile, Marmon, Moon, Nash, Oakland, Oldsmobile, Packard, Peerless, Pierce-Arrow, Pontiac, Reo, Star, Stearns-Knight, Studebaker, Stutz, Velie, Whippet, Willys-Knight and Wolverine. The trucks shown are American LaFrance, Chevrolet, Corbitt, Cunningham, Erskine, Federal, G. M. C., Graham, Larrabee-Deyo, Reo, Roamer, Sayers and Scovill, Schnacht, Selden, Star, Stewart, Studebaker and Stutz. Of the fifty-six repair shop equipment exhibits there is one lathe, several grinding honing devices and other garage tools. While there are 156 exhibits of accessories there seems to be nothing startlingly new. The show committee is Charles D. Hastings, F. C. Chandler, Alfred H. Swayne and S. A. Miles.

Black & Decker Acquire Van Dorn Business

Announcement has been made that the Van Dorn Electric Tool Co., of Cleveland, manufacturer of portable electric tools, has been acquired by the Black & Decker Manufacturing Co., of Towson, Maryland.

The Black & Decker Manufacturing Co., incorporated in 1910 under the laws of Maryland, has specialized in the manufacturing and marketing of portable electric drills and other like tools, and has been closely connected with the automotive trade. Black & Decker products are distributed by jobbers of automotive products throughout the country. The Van Dorn Electric Tool Co. has designed and built a line of electric drills, electric reamers and other similar tools of a specialized class to meet the demands of the large industrial enterprise.

S. Duncan Black, president of the Black & Decker Manufacturing Co., announces that there will be no changes in personnel or general activities of the two organizations. Included in the purchase of the Van Dorn Electric Tool Co. are the factories, complete tool equipment, inventories, land and all assets as of the date of purchase. Van Dorn electric tools of the same styles and designs will continue to be manufactured at the Cleveland plant, having the same Van Dorn identity as heretofore, and will be marketed through the existing Van Dorn sales organization and distributors. Likewise there will be no changes effected in the Black & Decker line of products, or sales and distributing organization.

Franklin Schneider will continue as president of the Van Dorn Electric Tool Co., and F. H. Zulauf will be vice-president and general sales manager.

Business Paper Editors Say Trade Is Sound and on Up Grade

Lower production costs to be a factor in 1928

INTENSIVE selling and pressure to lower production costs characterized business for 1927, and 1928 will develop along the lines of the year just closed, according to the consensus of one hundred editors of trade, industrial and professional journals in answer to a questionnaire sent to them by the National Conference of Business Paper Editors and the Associated Business Papers.

Business is sound. There are no indications of a slump, but rather definite indications of increase in several lines. No excess inventories are reported either in wholesale or retail, except in a few specialties where the market has been over-estimated. Farm buying power will be larger in 1928.

Editors of papers report increased pressure to reduce production and selling costs, higher specialization in machinery, wide-spread replacement of obsolete and inefficient machinery, aggressive market finding, reduction in size and intensive development of jobbing areas. There is likewise a genuine desire to keep wages at their present level in all the basic industries and manufacturers and merchants are seeking to continue with narrow profit margins without reducing wages or raising prices. Some trades show softening in prices, but most trends indicate price of 1928 about the same as 1927.

General construction is reported lower due to reduction of residential building, with industrial construction and certain classes of public works building very much increased. Heavy construction is 11 per cent higher, industrial construction is 2½ per cent higher, electric light and power plant construction about 5 per cent over 1926, with an estimated additional 5 per cent increase in 1928. It is expected that some $940,000,000 will be invested in construction and equipment in the electric light and power industry in 1928.

Production Machinery Needed

In the automotive industry expenditures for new plants were larger in 1927 than in 1926 due especially to one or two very large construction enterprises and the remodelling of the Ford plant. High specialization in machinery to reduce production costs marked several basic industries. Steel mills averaged 75 per cent of capacity in 1927 against 83 per cent in 1926; pig iron capacity 73 per cent in 1927 against 80 per cent in 1926. In metal working lines the average of working operations was about 15 per cent less than in 1926. Nineteen twenty-eight is expected to equal 1927.

Prices throughout 1927 are reported as slightly lower and margin of profit less, but the outlook for 1928 is generally considered favorable with some slight price increases. Pig iron prices during 1927 average 10 per cent less than in 1926 and steel prices were 4 or 5 per cent less. The profits of steel companies for the first nine months were from 15 to 20 per cent less than for the same period in 1926.

In general the close of 1927 finds the industries of the United States with stocks which deviate little from the volume at the close of 1926, reflecting continued hand-to-mouth buying. Iron and steel stocks are considerably lower than they were a year ago and the unfilled orders of the steel companies are from 12 to 15 per cent below those of the close of 1926.

Difference Between Value and Assessment

In discussing "The Valuation of Public Utilities" before the American Economic Association, Arthur Twining Hadley, president emeritus of Yale University said:

"Valuation and assessment are quite distinct things. An assessment is a price fixed by a constituted authority for its own purposes. A valuation is an attempt to determine what a piece of property is worth. A value is created by public demand, not by political authority. It is calculated on the basis of 'fair market price.'

"Until recently the words value and valuation had their definite meaning in American law, as they still have it in American business usage. But about thirty years ago, Senator LaFollette, in his attempt to find a basis for judging whether rates were reasonable, assessed the cost of duplication of the railroads concerned and called the result physical value.

"Was he justified in applying the old and well understood name value to such an assessment? Those who say yes base their answer on three different grounds.

"The first group says that they have discovered another kind of value, a physical value as distinct from a commercial value. The obvious answer is that there was no such thing to discover. Physical value is a contradiction in terms.

"Value is a social phenomenon, not a physical one. Value is not a thing inherent in goods themselves. It is a result of their adaptation to the needs and wants of the people; in other words, of demand.

"The second group sees that physical value is a fiction but holds that duplication cost furnishes a good measure of value. The answer is that it is a very bad measure. We can find many railroad lines whose cost of duplication would be more than ten times as great as their commercial value to their present owners or to any other owners. A yardstick that is liable to an error of over 1,000 per cent cannot be called a good measuring rod.

"A third group more intelligent than the other two, sees that cost is not a kind of value, and is not a good measure of value as it is, but says that it is a good measure of value as it ought to be. If an ordinary merchant, investigating prudently, finds it hard to make over 6 per cent, 6 per cent on prudently invested capital ought to be enough to allow the investors in large corporations.

"The difficulty with this answer is that large investments in progressive industries are subject to risks from which merchandise is free. You cannot limit the profits of the successful concerns to the ordinary rate of commercial discounts without preventing development and improvements. We have had a signal example of the failure of the attempt in the history of railroad development in recent years.

"If there is not enough demand for a given sort of merchandise in one place it can be sent to another. If there has been an overproduction of that merchandise which makes prices too low everywhere the surplus supply can soon be used up. The consequence is that the price of merchandise seldom falls very far below cost. But in the case of fixed investment the matter is different.

"The capital once invested in a power plant or railroad must stay where it is and cannot go somewhere else. If the local demand falls short of the expectation the risk involved in locating a plant in a new territory is very great. The risk in developing new processes with it is greater still."

Labor Association on Legislation

How trade and labor associations are affected by newer interpretations of the Sherman act, and how Uncle Sam treats his workers in the public service were discussed at the twenty-first annual meeting of the American Association for Labor Legislation, which was held in Washington, Dec. 27 to 30. Other subjects discussed included the increasing need for modern legislation to deal with industrial accidents in the new industrial South; the high cost of being sick; the burden of old age dependency; post-war advances in social insurance; prevention of needless coal mine accidents, and old age pensions.

Sessions were held jointly with the American Economic Association, the American Statistical Association, and the Stable Money Association, to discuss industrial efficiency and social welfare; labor legislation and the business mind; the role of statistics in forecasting; ideals and idealism in taxation, and the question whether a falling price level is compatible with prosperity. Speakers on the program included economists, public officials, journalists, safety and health experts, and representatives of labor and industry.

McGraw-Hill Advisor on Educational Tour

Robert M. Davis, statistical advisor of the McGraw-Hill Publishing Company will leave New York on Jan. 14 for a speaking trip which will take him through the Mountain and Pacific States and back through the South. Mr. Davis will speak before numerous business, industrial and educational organizations on "The Industrial Outlook for 1928."

This address is based upon extensive economic studies which have been made by various members of the McGraw-Hill organization, and will be supplemented by colored lantern slides, bringing out some of the outstanding economic points of the talk. Mr. Davis is an optimist on 1928 industrial conditions although he does not look for a so-called "business boom" during the year. He does believe, however, that we have developed certain economic conditions which make a continuance of our present industrial prosperity a probability, and an industrial recession of any magnitude during 1928 as highly improbable. The address will cover the status of American industrial operations as the year 1927 closes, the outstanding favorable and unfavorable economic factors on the horizon as the year 1928 opens, the balance which has recently developed in general industrial operations, and the influence of the presidential election.

Automotive Exports Show Increase

The combined exports of automotive products from the United States during the first eleven months of 1927 amounted to $377,458,512, indicating that the year's shipments may exceed a valuation of $400,000,000 according to the automotive division of the Department of Commerce.

The division reports that despite the usual seasonal decline in domestic production, attributed to the regular inventory period and the reduced domestic demand, the value of November automotive shipments amounted to $31,197,629, a gain of 12.2 per cent over the like period of 1926, as well as an increase of 5.9 per cent over October of this year.

Trucks Almost Half

Truck exports during the month under review numbered 10,009 units and represented 41.2 per cent of the month's production. The shipments under this classification reached the highest point since May and registered the fourth highest shipments of trucks during the current year. Passenger car exports numbered 21,396, or 19.6 per cent of the total month's production. The combined passenger car and truck exports from the United States for the first eleven months of 1927 amounted to 360,590 units, having a value of $257,898,782. During the same period of 1926, the corresponding exports numbered 279,599 units valued at $204,206,589, and in 1925 the total was 269,416 units valued at $199,768,779. Passenger car and truck production during the first eleven-month period amounted to 2,832,117 passenger cars and 427,200 trucks as against 3,668,903 passenger cars and 461,960 trucks for the same period of 1926.

Twenty Countries Will Exhibit at the Leipzig Fair

More than 2,000 buyers and exhibitors from all parts of the United States are expected to take part in the Leipzig Fair to be held March 4 to 10. The increase in American participation indicates a notable expansion of its trade in world markets. Fully 10,000 exhibits of the latest industrial products or more than twenty countries will be on view, while the fair will be attended by upwards of a quarter of a million buyers from forty-four countries.

The Leipzig Fair has tripled in size and attendance since the war. It offers exhibitors an opportunity to reach buyers from all parts of the world. It is estimated that American buyers visiting Leipzig in the spring will spend more than $2,000,000 in expenses alone.

The group of one hundred special exhibition buildings which house the Leipzig Fair will be increased this year and many new features introduced. A new hall, twice the size of the Madison Square Garden in New York, has been built to house the special automobile exhibit of commercial cars. Additional floor space is devoted to 2,000 exhibits of textile machinery and its products.

A.S.S.T. Meeting in Canada

The semi-annual meeting of the American Society for Steel Treating will be held at the Mount Royal Hotel, Montreal, Canada on Feb. 16 and 17. This meeting will provide an opportunity for meetings of the board of directors and the numerous committees of the society, as well as permitting time for five technical sessions. Papers of wide importance to the industry will be presented. At this season of the year an excellent opportunity is afforded the visiting delegates to participate in the various winter sports provided in the Canadian country.

One of the features of the meeting will be a series of plant inspections which will take the members to some of the largest and most important manufacturing plants in Canada. Among the plants already listed for these inspection trips are the Canadian Steel Foundries, McVickers, Ltd., the Dominion Engineering Works, the Dominion Iron Works and one or two of the large paper and pulp manufacturing plants. During the morning of the first day there will be special meetings of the committee on recommended practices and that on publications.

Navy Orders Twenty Loening Planes

A contract for the purchase of 20 model "OL-8" Loening amphibian airplanes and spare parts at a cost of $503,003 has been awarded by the Navy Department to the Loening Aeronautical Engineering Corporation of New York, acccording to a statement by the Department made public on Dec. 23.

The planes will be equipped with 420-hp., air-cooled motors, manufactured by the Pratt & Whitney Aircraft Corporation, of Hartford, Conn.

Orders for the planes is the result of recent tests with a Loening amphibian powered with an air-cooled engine. Tests proved this plane is superior in performance to the old types with water-cooled engines.

The new machines are much more efficient than previous types. The air-cooled engine has reduced the weight by 500 lb., thereby permitting greater loads in fuel or armament. They are biplanes measuring 45 ft. between wing tips, weigh 3,249 lb. and carry a normal load of 1,500 lb., including radio, fuel, machine guns and bombs. With a crew of three and full service equipment they have a speed of 125 miles an hour.

R. F. Schuchardt Proposed by Electrical Engineers

The national nominating committee of the American Institute of Electrical Engineers, consisting of fifteen members from various parts of the country, has nominated the following official ticket of candidates for the offices falling vacant Aug. 1, 1928:

For president: R. F. Schuchardt, electrical engineer, Commonwealth Edison Co., Chicago.

For vice-presidents: North-Eastern district: E. B. Merriam, executive engineer, switchboard department, General Electric Co., Schenectady; New York City district: H. A. Kidder, superintendent of motive power, Interborough Rapid Transit Co., New York; Great Lakes district: W. T. Ryan, professor, electrical power engineering, University of Minnesota, Minneapolis; South-West district: B. D. Hull, engineer, Southwestern Bell Telephone Co., Dallas; North-West district: G. E. Quinan, chief electrical engineer, Puget Sound Power and Light Co., Seattle.

For managers: A. E. Bettis, vice-president, Kansas City Power and Light Co.; J. Allen Johnson, electrical engineer, Niagara Falls Power Co.; A. M. MacCutcheon, engineering vice-president, Reliance Electric and Engineering Co.

For treasurer: George A. Hamilton, electrical engineer, Elizabeth, N. J.

These official candidates, together with any independent nominees that may be proposed later, will be voted upon by the membership at the coming election in the spring.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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ONE of those famously sagacious Rothschilds is said to have observed that it was never necessary to run to the Stock Exchange. Perhaps he was the same philosopher who remarked that the trees never reach to the skies despite their constant growth.

These epigrams are quoted by way of antidoting the Pollyanna optimism that pervaded nearly all the New Year's forecasts of 1928 that were published during the holiday season. Everybody from the President and Secretary Mellon down seems to agree that the coming year will be one of the most prosperous this country has ever seen. It is to be hoped that they are right, but "Beware when all men speak well of thee," is advice for which there is high authority, and it is as applicable in the world of business as it is in the social or spiritual sphere of life.

But it must be admitted that the post-holiday stock market has not thus far reflected any abatement of the prevailing optimism. The volume of trading is the largest that has ever been recorded, the turnover having twice exceeded 3,000,000 shares daily. A new market for shares not listed on the Stock Exchange or the Curb Market is being organized on the New York Produce Exchange. Many stock brokers are advising their customers to take profits, and the market reacted somewhat on Thursday. But most speculators still seem to think that declines are but incidents in a main upward trend, despite the continued increase in brokers' loans, which, according to the compilation of the New York Stock Exchange, advanced $341,000,000 during December to the new high record of $4,433,000,000, while the Federal Reserve Board's weekly reports show that the increase has continued since.

The export of gold, and the loss of $151,000,000 through shipment and earmarking in 1926, is also disregarded; it is apparent that the many recent statements to the effect that the operations of the Federal Reserve Banks would cushion the shock of gold shipments have acted as an anesthetic upon those whom the loss of gold would normally alarm.

Money rates as usual have declined since the holiday funds began to flow back into the banks, and perhaps a further advance in stock prices will be seen, but it is just as well to remember that the trees never grow to the skies.

The commodity markets have moved with less unanimity, and cotton in particular has had a decline, which seems paradoxical when the strength of the statistical position is considered. It is ascribed to the belief that cold weather in the South has killed the boll weevil. This is the first time on record that the weather in mid-winter has effected cotton prices so sharply, and those who realize what a deceitful guide even summer weather is to the yield will hesitate to sell the 1928 crop so confidently before the acreage is pitched as long as there seems to be a trade demand for all the cotton that is offered.

Grain prices are virtually unchanged. There is enough wheat in sight to supply world needs but no depressing surplus, and the lower prices for corn undoubtedly discount the abundant supplies to some extent.

WHAT'S DOING IN INDUSTRY

THE FIRST week of the new year showed little except a reflection of the good business that appeared so unexpectedly in the closing weeks of 1927. A genuine spirit of optimism prevails throughout the trade, and with the beginning of new production schedules in major industries much of the pending business will be released. The automobile industry, in particular, is depended upon to furnish a good part of the first-quarter volume.

CINCINNATI enters the new year with manufacturers and dealers encouraged over the widespread industrial activity. Detroit already reports increases in sales and inquiries, with auto manufacturers going confidently ahead with enlarged production programs. Good prospects are noted in Chicago but current orders are slow. Automotive, farm implements and public utilities projects are furnishing activity in Indianapolis.

THE SOUTH is opening up well, with inquiries promising a good quarter volume of sales. Current demand is off in Canada, but the steel and paper industries are just getting ready for some new expansions that will require machine equipment. New England as a whole is quiet, but the Western section shows some signs of future activity that is promising. New York dealers are optimistic over the trend of general conditions and expect a lively market in the next two months.

The first available estimate of the holiday trade is that made by the New York Federal Reserve Bank, which reports that December retail sales, up to Christmas Eve, in its district exceeded those of last year by 3½ per cent. Concurrently, the newspapers say that there is more unemployment in New York City this winter than there has been since 1921. The two statements seem inconsistent, but there are so many inconsistencies in the facts which are thrown up to the surface of our deeply flowing economic stream that to attempt their reconciliation is hardly worth while. The reports of the mail order houses and chain stores fit in the picture of a record holiday trade, for they closed the year in a blaze of glory. One of the big mail order houses sold 15 per cent more in December than it did a year ago and the other 8.2 per cent more, while the increases shown by chain stores ranged all the way up to 30 per cent.

This activity in the distribution of goods to the ultimate consumer, coupled with the decline in production that occurred during the second half of 1927, is assurance that stocks are not unduly large, and if it can be assumed that, thanks to agricultural prosperity, the nation's purchasing power in 1928 will be as large as that of 1927, a gradual increase in industrial production ought to follow.

For the automobile makers the show season is on, and its optimism is particularly buoyant this year because the manufacturers believe with reason that a combination of low prices and a potential demand carried over from 1927 will induce record buying. Therefore a substantial increase in production as the spring wears on is expected. The iron and steel manufacturers say their order books justify a stepping up of output, and in building the continuance of heavy construction activity is relied upon to keep the figures high, while the Associated General Contractors report that the total value of new construction in 1927 was 4 per cent over that of 1926.

This detailed record justifies hope, at least, that 1928 will bring a more abundant business to the United States, and it is only in the direction of the stock market that one need look for a blow that might "upset the apple cart." There is a difference between sane confidence in the recuperative power of commerce and industry, after a contraction such as that of the past six months, and a blind belief that it will be accompanied by ever-rising stock prices which ought to be kept particularly in mind this year.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CHICAGO

Business in the machine tool industry, closely following the holiday season, and pending the completion of inventory taking and the preparation of railroad budgets for 1928, is without any outstanding feature. December's volume of sales in a few instances showed to better advantage than that of November, but the greater number of dealers report December sales as somewhat below the average of the preceding month. Railroad lists for new equipment, looked forward to by machinery men as affording an opportunity to measure expectations for spring business, are still being withheld, and it is not thought the first lists will be distributed before the latter part of this month.

It is generally understood that considerable business during the early months of 1928 will come from agricultural machinery plants, which, it is confidently reported, purpose replacing many old and outworn tools with new and up-to-date equipment.

INDIANAPOLIS

The year end showed no change in the machine tool or machinery business. A spirit of optimism, however, permeates the trade. Several manufacturers are watching developments in the rail and oil industries very closely, and inquiries from both these sources are being received. Actual sales are not expected until after business resumes its natural trend.

Increasing production in the automobile factories is helping some of the trade, but this business has not developed sufficiently to determine just what the volume will be. Year end reports from virtually every automobile factory in Indiana indicate that they will speed up production before the middle of January. Inquiries from this source also are numerous.

Some sales of radial drills, small lathes, grinders and similar equipment have been made. It is believed the demand for garage equipment will begin to pick up before the end of the month. Demand from the steel trade, however, continues very slow. Inquiries from farm implement factories are more numerous than at this time last year and the outlook is much brighter.

CINCINNATI

Machine tool manufacturers and selling agents in the Cincinnati district state that the new year has started out in a most encouraging manner. Orders that had been held back are beginning to come in and the volume of business is increasing from day to day. No pessimism is expressed, but instead of this there is a general feeling that a better market is developing, due to the fact that business conditions are improving in all sections of the country and this is bound to be reflected in the machine tool industry.

A feature of the week's business was an order coming from Holland for large lathes. A considerable portion of the week's business consisted of the closing of orders that had been pending for some time.

The inquiries received during the week are regarded as most encouraging. They came in good volume, from all sections of the country, were for all classes of tools and were from practically all classes of users. Several concerns report that they have had an unusual number of requests for their latest catalogs, and this is taken to mean that many purchases are developing. The Cincinnati Electrical Tool Co. announced last week a substantial reduction in the prices of its line of portable air-cooled electrical drills.

DETROIT

The first week in January was marked by many significant occurrences. The market for machinery and machine tools is much better than dealers had expected it to be; the many new models and the price cuts in the automobile field give ample evidence of the trend of the immediate future. Another interesting fact is that employment is gaining steadily.

December was a much better month than it usually is here, and dealers were surprised in many instances by the volume of business they received. There was, of course, the customary let-up to permit of the taking of inventories and the like, but in spite of that business held up remarkably well.

Consequently, dealers expected little or no action at the immediate beginning of the year and they were again surprised by the receipt of substantial orders for production and replacement machinery. Many large and expensive machines have been ordered. Inquiries are numerous and the general feeling is optimistic.

The announcement of price cuts and changes in design by Packard, LaSalle, Cadillac, Overland, Pontiac, Oakland and Chevrolet; and the new models of Dodge, Hupp and Studebaker have done much to stimulate the machinery field. The Ford Motor Co. is rapidly getting under way on its program of production and is adding constantly to its personnel.

EASTERN NEW ENGLAND

According to representative Eastern New England houses dealing in machine tools and machine shop supplies, business continues to be seasonably inactive. Some houses report inquiries as gaining in number, although closings are not expected to be consummated until late in January. In nearly every case, however, the real stride will not be attained until after inventories.

Transactions in machine shop supplies are reported as continuing in volume, although most orders are for rather small lots. Shop furniture enjoyed a satisfactory volume in December, and houses are confident that business during this year will attain an average equal with that for last year.

WESTERN NEW ENGLAND

The early weeks of January give encouraging indications for a good volume of business in the Western New England section. Plants co-ordinating in production for the automotive, radio and electrical industries are actively engaged on full schedules. There is evidence of overproduction in other lines, particularly the valve and pipe manufacturing industries. Some of these plants are on short schedules.

Manufacturers and dealers in the machinery and machine tool field, as a whole, are looking forward to improved conditions in 1928. A remarkable amount of optimism is displayed. Actual orders in anything like a comparative measure, are another thing. Dealers in used tools find buyers reluctant to close at the prices quoted. This has resulted in price cutting.

New lists to reach this section include a turret lathe, shaper, two radial drills, milling machine and a profiling machine.

CANADA

While demand for machinery and machine tools in Canada has fallen off slightly during the last couple of weeks, the outlook for the first quarter of the year is very encouraging. Business and industry generally throughout the country give promise of a decidedly busy season. Major industries, it is fully expected, will experience more activity, especially iron and steel, automobiles, newsprint, paper and pulp.

Iron and steel consumers have been specifying more freely against their old contracts, and have been covering rather liberally for first quarter delivery. Another favorable factor is the prospect for an improved demand from the automobile industry, which has been seriously curtailed during the non-producing period of the Ford factories. The broad outlook for the electrical industry is also bright.

SOUTHERN DISTRICT

Though it is still too early in the year for sales to have shown any real activity, machinery and machine tool dealers state their inquiry is good, and that fair business is in prospect the first quarter of this year. However, there are few dealers who believe business in the first quarter will be as active as it was during the first quarter of 1927, though the reason for this is not because the outlook is poor, but because sales in 1927 were unusually good.

In the woodworking field a few sales are reported to some of the larger furniture plants, as this industry is facing a good year and is enlarging production facilities, while there have also been some sales recently to companies that are engaged in the erection of new furniture or lumber plants in this district.

Conditions in the textile industry are not particularly good, and sales and inquiries are both slow.

Railroad equipment sales are quiet as yet, and smaller machine shops and service stations are placing very few orders.

NEW YORK

The first ten days of the new year brought an activity in the machinery and machine tool market in this territory that convinces most dealers that the predictions for 1928 were reliable. Orders, of course, are small, and represent the closing of requirements that were practically settled upon in December. No new inquiries of size are reported, although several calls are reported for single tools to be used as replacements.

A good volume of business is reported by dealers and jobbers in small tools used in the building and construction industries. Railroads are also reported more active, the Jersey Central and the New York Central having lists out for equipment.

As an indication of the widespread industrial buying activity we mention here a few of the purchasers of machine tools in the past week: Frigidair Corporation, National Lamp Works, Timken Roller Bearing Co., General Electric Co., Buick Motor Co., Botwinik Bros., Moore Drop Forge Co., the Norton Co., Magol Car Corporation, Wyman Gordon Co., and the Ingalls-Shepard Co. Two railroads and several small machine shops were also represented.

Michigan Conference of Engineers

The program for the annual meeting of the Michigan Engineering Conference, which will be held Jan. 27 and 28 in the Hotel Statler, Detroit, will cover a variety of subjects of wide interest to engineering groups. The titles of the papers, with their authors, are as follows:

"Commercial Aviation," by William B. Stout, Stout Metal Airplane Co.; "The Electrification of Railways," by W. M. Vandersluis, Illinois Central R.R.; "The Relation of the Engineer to Management," by John Lyle Harrington, Kansas City; "Science with Art in Lighting," by A. L. Powell, Edison Lamp Works; "Welding," by Prof. Comfort A. Adams, Harvard University; "City Planning and Water Front Development," by E. L. Cousins, Toronto; "The Mississippi River Problem," by Arthur M. Morgan, Antioch College; "Two Blades Where but One Grew Report," by C. F. Hirshfeld, Detroit Edison Co.; "X-Rays as an Engineering Tool," by Prof. George L. Clark, University of Illinois.

Steel Treaters Plan Western Exhibit

The board of directors of the American Society for Steel Treating has announced that the Western Metals Exposition will be held in Los Angeles, Calif., in January, 1929. This decision was made after a careful examination of a questionnaire sent out to the members of the association and to those who have patronized the steel exhibits of the association in the past. This exposition will be confined strictly to the West and will not in any way supplement the regular tenth annual convention and exposition of the association which is to be held in the Commercial Museum, Philadelphia, during the week of Oct. 8 this year. This Western Metals Exposition will be held at the same time as the semi-annual meeting of the society and will be in the nature of an effort to broaden the scope and strengthen the Western section of the association. It was felt that by selecting the middle of January that those exhibitors from the East who desire to go to the Coast would have an opportunity to leave after the first of the year and arrive in time to arrange their exhibits and to participate in the technical sessions of the convention.

U. S. Chamber Publications

"Our World Trade" is the title of a booklet just issued by the foreign commerce department of the Chamber of Commerce of the United States. It covers the period January to September, 1927, and gives the value and volume of principal exports and imports between the United States and chief foreign markets. Fourteen tables are included, which itemize trade exchanges with practically every country in the world. The booklet contains invaluable data for the manufacturer or trader who is interested in foreign markets.

The same organization has issued another booklet entitled "Foreign Trade Promotion," which deals with the work being done in the field of foreign commerce by trade associations and chambers of commerce. Either of these publications can be obtained from the Washington office of the United States Chamber of Commerce.

Pratt & Whitney Veterans Honored for Service

At the close of the working day on Christmas eve, employees of the Pratt & Whitney Co., of Hartford, Conn., were assembled in the executive offices where two of the oldest employees of the company were presented with gold pieces by C. R. Burt, vice-president and general manager of the plant. Flavel W. Woodworth, who recently completed sixty years of continuous service with the company, and Eugene F. Laporte, who has fifty years to his credit, were the veterans so honored.

The two veterans greeting each other outside the Pratt & Whitney offices. F. W. Woodworth is at the left, and E. F. Laporte is at the right

Mr. Woodworth joined the Pratt & Whitney Co. in 1867 as an apprentice. For the past 40 years he has been running a planer and is considered one of the most skillful operators in the shops. Mr. Laporte started as an errand boy in 1877 and has become the trusted special messenger for the executive offices.

At the brief ceremony at which the presentation was made, Mr. Burt spoke of the loyalty and faithful service of these two veterans and wished them many more years of health and happiness in their work.

Foreign Trade Helped Stabilize Business

The value of foreign trade as an effective even though relatively moderate stabilizer of our general business position was never more clearly demonstrated than in 1927. Exports will exceed $4,925,000,000 and attain the substantial increase of 18 per cent in volume and 2½ per cent in value over 1926, according to a recent statement by Julius Klein, director of the Bureau of Foreign and Domestic Commerce. This gratifying result represents a steady, normal rate of advance and was achieved in considerable measure by the efforts of several industries which, having suffered a slackening of domestic trade below the record figures of 1926, due in part to price declines, found a most helpful corrective through the more intensive exploitation of overseas markets.

This expansion in our exports, together with a decline in the value of our imports has resulted in doubling our "favorable" balance of trade which will exceed $700,000,000, the largest since 1924. It should be noted, of course, that this "favorable" factor is modified by heavy increases during the year of many invisible items such as foreign loans, tourists expenditures and immigrant remittances. Our foreign loans during the year will reach the record volume of $1,600,000,000 and doubtless has had a considerable effect in increasing the volume of our export trade. There was also a large increase in our tourist expenditures abroad which were substantially in excess of the $761,000,000 figures for 1926.

Trend Is Upward

Although domestic business was somewhat adversely affected by a sag in industrial prices, the trend since mid-year has been upward and figures in general for December have been nearly up to the average for the year 1926. Then too there have been a number of other reassuring developments in the domestic situation.

During the early months of 1927, industrial production continued at or near the high level of the preceding year. Then came the usual summer seasonal slump, but the recovery in the autumn was not as marked as had been hoped. However, many individual industries have operated at a higher level than a year ago and at the present time there are distinct evidences of an upward trend.

In summarizing our foreign trade for 1927, we may say that it has continued to show remarkable growth in spite of a general lowering in world price levels and a moderate reduction in the activity of domestic business as compared with 1926 record figures. Our exports have shown a substantial growth, indicating a further strengthening of our position in world markets, while the maintenance of our imports at about the same high level as in 1926 indicates the general prosperity of this country.

Personals

HAROLD A. THOMAS, professor of hydraulics at the Carnegie Institute of Technology, has been appointed hydraulic engineer for the city of Pittsburgh.

WILLIAM O. MACLEAN has been appointed general superintendent of the foundry and pattern shop departments of the Canadian General Electric Co. plant at Davenport, Toronto, Ontario.

PETER F. KEARNS has been appointed foundry superintendent at the plant of John Bertram & Sons Co., Ltd., Dundas, Ontario, to succeed George Manning, who has retired.

COMMISSIONER JOHNSTON B. CAMPBELL has been elected to serve as chairman of the Interstate Commerce Commission for 1928. It is the policy of the Commission to rotate the chairmanship from year to year in the order of seniority of service.

EUGENE D. MILENER, who has been associated with the Consolidated Gas, Electric Light and Power Co., of Baltimore, for several years, has been appointed representative of the industrial gas research bureau of the American Gas Association.

CLINTON M. FINNEY has been elected comptroller of the Westinghouse Electric and Manufacturing Co. Other officers chosen for the new year are: Warren H. Jones, secretary, and Edward J. Mulligan, assistant secretary.

GEORGE L. POLLOCK, vice-president and treasurer of the Burnside Steel Foundry Co. since its organization, has resigned to become vice-president of the Nugent Steel Castings Co. of Chicago. Prior to becoming associated with the foundry industry, Mr. Pollock had been purchasing agent of the Wheeling & Lake Erie R.R., the Chicago & Western Indiana R.R., and Belt Railway Co., of Chicago.

S. W. CALHOUN has joined the sales organization of the Foote Bros. Gear and Machine Co., and has been appointed Southeastern district Representative with headquarters at Asheville, N. C. From this point he will control the states of Tennessee, Kentucky, Virginia, North and South Carolina, West Virginia except the Northern section which is handled from the Pittsburgh office.

GEORGE F. ANGLIN, for the past four years Pittsburgh manager of the Torrington Manufacturing Co., Torrington, Conn., and the Blake & Johnson Co., Waterbury, Conn., before its merger with the former concern, has joined the machinery and equipment sales department of the Mackintosh-Hemphill Co., Pittsburgh, manufacturer of rolling mills and rolling mill equipment.

A. H. GRAYBURN, assistant secretary and assistant treasurer of the Norma-Hoffmann Bearings Corporation, Stamford, Conn., has resigned to take an important executive position with the Hope Engineering and Supply Co., of Mount Vernon, Ohio, and New York City. A. H. Ritter, New York district manager, goes to Stamford as assistant secretary, and will be succeeded in New York by F. W. Mesinger from the Stamford office. Norman Bell, assistant sales manager, has been made assistant secretary. E. C. Lenon at Stamford will be in charge of orders, shipments, credits and collections.

Business Items

The Coats Machine Tool Co., Inc., of 110 West 40th St., New York, has been appointed exclusive agent in the United States for Friedrich Krupp, of Essen, Germany, in the sale of measuring instruments.

The Nye-Mosher Manufacturing Co., 3617 S. Ashland Ave., Chicago, has been incorporated to manufacture and deal in machines and mechanical, electrical and chemical devices, tools, etc.

The Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, has taken out letters of incorporation. The corporation will manufacture and deal in tools, dies and machinery.

The Hendrick Manufacturing Co., of Carbondale, Pa., manufacturer of steel grating, stair treads and armorgrids, announces the opening of a Chicago district office at 223 Railway Exchange Bldg., in charge of Lon Sloan. Mr. Sloan's extensive experience is available to those concerned with the selection of reinforcing materials.

The Pratt & Whitney Aircraft Co., of Hartford, Conn., has leased the manufacturing rights to its aviation engines to the Bavarian Motor Works, Munich, Germany. The latter company is one of the outstanding concerns in this line of manufacture. It has not manufactured an air-cooled engine, and officials of the company while in this country inspected the air-cooled engines made by the Whitney company. An agreement was reached so that the engines will be manufactured in the plant of the Bavarian Motor Works.

The Cutler-Hammer Manufacturing Co., of Milwaukee, Wis., manufacturer of electric motor control apparatus and allied lines, will handle its own Pacific coast sales from its own offices at 970 Folsom St., San Francisco; 229 Boyd St., Los Angeles; and 2203 First Ave., South, Seattle. The new sales district will be in charge of Fred H. Oberschmidt, a member of the Cutler-Hammer organization for over fifteen years. Associated with Mr. Oberschmidt at the San Francisco headquarters office will be A. A. Tuffert and George P. Stone. Thomas N. Bristow will be in charge of the Seattle office; and Edward G. Nelson of the Los Angeles office. Complete stocks of standard items in the Cutler-Hammer line will be carried at all Pacific coast offices.

Obituaries

CHARLES F. DALY, vice-president of Durant Motors, Inc., and former vice-president of the New York Central R.R., died in New York City on Jan. 6.

MARVIN HUGHITT, one of the pioneers in American railroading, and for 25 years president of the Chicago & Northwestern R.R., died in Chicago on Jan. 6.

WILLIAM H. BURROUGHS, for many years vice-president of the Charles Burroughs Co., of Newark, N. J., hydraulic engineers, died at his home in Chatham, N. J., last week.

GEORGE W. TRAUT, vice-president of the North & Judd Co., New Britain, Conn., tool manufacturers, died on Dec. 29 in that city. He was 56 years old and formerly president of the Traut and Hine Manufacturing Co.

BENJAMIN FRANKLIN JONES, JR., chairman of the board of Jones & Laughlin Steel Corporation, died at his home in Pittsburgh on Jan. 1. Mr. Jones entered the steel business in 1891 with the firm founded by his father. He was successively manager treasurer, president and then chairman of the board.

LEWIS P. MEAD, president of the Mead Electric Co., Ltd., electrical engineer and contractor, of Montreal, died at his home in that city on Dec. 28. Mr. Mead was born in Providence, R. I., and moved to Montreal in 1897, as factory superintendent of the Eugene F. Phillips Electrical Works. In 1910 he formed the Mead Electric Co., Ltd.

Air Mail Grows

Prediction that within three years commercial airplanes in the United States will fly 50,000 miles daily was made recently by W. Irving Glover, second assistant postmaster general, in connection with a report made by him to Postmaster General New on present mileage and tonnage on commercial air lines carrying United States mail.

This report shows that at present these lines are flying 17,314 miles daily with the prospect of an additional daily mileage within three months of 4,094, making a total of 21,408 miles.

The length of existing routes on which air mail is carried is 9,000 miles, to which 2,047 miles will be added within three months. During the month of November planes in the contract air mail service traveled a total distance of 456,434 scheduled miles, carrying 141,079 lb. of mail, for which the contractors were paid $304,082.

Forthcoming Meetings

National Safety Council. Rhode Island Industrial Safety Conference, Biltmore Hotel, Providence, R. I., Jan. 17. A. A. Mowbray, secretary, 108 East Ohio St., Chicago.

Society of Automotive Engineers. Annual meeting, Book-Cadillac Hotel, Detroit, Mich., Jan. 24 to 27. C. E. Heywood, in charge of meetings, 29 West 39th St., New York City.

Foundry Equipment Manufacturers' Association. Annual meeting, Feb. 7, 1928, Cleveland Hotel, Cleveland, Ohio. H. Cole Estep, secretary, 1213 Third St., Cleveland.

American Society for Steel Treating. Semi-annual meeting, Montreal, Canada, Feb. 16 and 17, 1928. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland.

American Gear Manufacturers' Association. Twelfth annual meeting, Rochester, N. Y., April. Details later. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

American Welding Society. Annual meeting, week of April 23, New York City. M. M. Kelly, secretary, 33 West 39th Street, New York City.

American Railway Association. Schedule of sectional meetings: Division IV, Engineering, March 6 to 8, Chicago Division V, Mechanical, June 13 to 20, Atlantic City, N. J.; Division VI, Purchases and Stores, June 13 to 15, Atlantic City, N. J.

National Metal Trades Association. Thirtieth annual meeting, Hotel Astor, New York, April 25 and 26. J. E. Nyham, secretary, Peoples Gas Bldg., Chicago, Ill.

National Foreign Trade Council. Fifteenth anniversary convention, Houston, Texas, April 25, 26 and 27. O. K. Davis, secretary, India House, Hanover Square, New York.

National Association of Purchasing Agents. Annual meeting and "Informashow," Kansas City, Mo., May 28 to 31. W. L. Chandler, secretary, 11 Park Place, New York.

Association of Iron and Steel Electrical Engineers. Annual meeting, Stevens Hotel, Chicago, June 25 to 29. J. F. Kelly, managing director, Empire Bldg., Pittsburgh, Pa.

American Society for Testing Materials. Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 25 to 29. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Aug. 29 to 31. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Aug. 29 to 31. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

REVIVAL of pig-iron demand is noted in the Birmingham foundries; orders are for first quarter delivery. Steel plates, shapes, sheets and car material lead in this week's buying activities. Dull market conditions, however, prevail in tie plates, standard spikes and light rails, owing largely to present depression in the coal mining industry. The total iron output for 1927 was 36,000,000 tons, against 39,000,000 for the year preceding. Bars, plates, and shapes hold firmly to the price of $1.80 per 100 lb., f.o.b., Pittsburgh. Rubber belting discounts are 5 to 10 points lower at New York warehouses this week.

(All prices as of Jan. 6)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities rom warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.05@2.15	3.50	3.25	3.89
No. 12	2.10@2.20	3.55	3.30	3.94
No. 14	2.15@2.25	3.60	3.35	3.99
No. 16	2.25@2.35	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.50@2.60	3.75	3.55	4.00
No. 22	2.65@2.75	3.90	3.70	4.15
No. 24	2.70@2.80	3.95	3.75	4.20
No. 26	2.80@2.90	4.05	3.85	4.30
No. 28	2.95@3.15	4.20	4.00	4.45
Galvanized				
No. 10	2.90@2.95	4.10	3.80	4.25
Nos. 12 to 14	3.00@3.05	4.20	3.90	4.35
No. 16	3.10@3.15	4.30	4.00	4.45
No. 18	3.25@3.30	4.45	4.15	4.60
No. 20	3.40@3.45	4.60	4.35	4.75
No. 22	3.45@3.50	4.65	4.40	4.80
No. 24	3.60@3.65	4.80	4.50	4.95
No. 26	3.85@3.90	5.05	4.75	5.20
No. 28	4.10@4.15	5.30	5.00	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to.30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches — ¼	⅜	½	⅝	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	5.70	6.10
Floor plates	5.25	5.30	5.00
Cold drawn, round and hex.†	3.30	3.65	3.60
Cold drawn, flats and squares	3.80	4.15	4.10
Structural shapes	3.34	3.00	3.10
Soft steel bars	3.24	3.00	3.00
Soft steel bar shapes	3.24	3.00	3.00
Soft steel bands	3.99	3.65	3.65
Tank plates	3.34	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 3/32 to ⅛ 7.35c. per lb. *Flat, 1/16@¼-in. thick. †Also shafting and screw stock.

METALS

Current Warehouse Prices in Cents Per Pound for Small Lots

Copper, electrolytic, up to carlots, New York			15.37½
Tin, pigs, 5-ton lots, New York			59.12½
Lead, pigs, up to carlots, E. St. Louis	6.30	New York	7.12½
Zinc, slabs, up to carlots, E. St. Louis	5.65	New York	6.57½

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	13.50	14.00	14.25
Copper sheets, base	22.75	22.75	22.75
Copper wire, base	19.37½	19.25	15⅝@15¾*
Copper bars, base	22.25	22.25	22.25
Copper tubing, base	24.50	24.75	24.50
Brass sheets, high, base	18.75	18.75	18.75
Brass tubing, high, base	23.62½	23.62½	23.62½
Brass rods, high, base	16.50	16.50	16.50
Brass wire, high, base	19.25	19.50	19.25

*Mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	24.30	26@27	26.02
Zinc sheets (casks)	11.00	12.65	10.36
Solder (½ and ½), (case lots)	36.75	37.50	34@38

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	76.00
Commercial genuine, intermediate grade	61.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	12.50

Nickel, f.o.b. refinery, cents per lb.:

Ingots	35.00	Electrolytic	37.00
Shot			36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper	12.25 @12.50	11.00	11.00@11.50
Copper, heavy, and wire	11.50 @12.25	10.75	10.25@10.75
Copper, light, and bottoms	10.00 @10.50	9.50	9.25@ 9.75
Heavy lead	5.25 @ 5.50	5.25	4.75@ 5.25
Tea lead	4.25 @ 4.50	3.75	4.00@ 4.50
Brass, heavy, yellow	7.25 @ 7.50	7.25	7.00@ 7.50
Brass, heavy, red	9.00 @ 9.50	9.75	9.00@ 9.50
Brass, light	5.50 @ 5.75	5.75	6.00@ 6.50
No. 1 yellow rod turnings	7.50 @ 8.00	7.50	7.00@ 7.50
Zinc	3.37½@ 3.62½	3.25	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	.15½@18	36.00 per M	.15
Sal soda, per lb	.03½	02	.02½
Roll sulphur, per lb	.027	03½	04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.79½	.89	76
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	.50	.50
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.27	.35	26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply			
Medium grade	35%	35%	35%
Heavy grade	30%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	45%	50–10%	50%*
Second grade	50%	60–5%	50–10%†

*Large quantities, 60%. †Large quantities, 60-10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.033	.04	.04
Brass rods	per lb.	.16½	.16½	.1637½
Solder (½ and ½)	per lb.	.36¾	.36¾	.41
Cotton waste, white	per lb.	.10@13½	10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.10
Lard cutting oil	per gal.	.65	.65	.55
Machine oil	per gal.	.27	.27	35
Belting, leather, medium	off list	35%	35%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$5.40	$4.95	$5.13
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton		Connellsville,	2.65@3.00
Coke, prompt foundry, per net ton		Connellsville,	3.75@4.50
White lead, dry or in oil,	100 lb. kegs	New York,	13.75
Red lead, dry,	100 lb. kegs	New York,	13.75
Red lead, in oil,	100 lb. kegs	New York,	15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.	55%
Larger up to 1 x 30-in.	50%
1¼ and 1½ in. dia.	35%
Carriage bolts:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Coach and lag screws:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in., incl.	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb.	$3.50*
Rivets, button and cone head:	
Small, including 7/16-in. dia.	50–10%
Large (base) per 100 lb. net	$5.00†

Note—For less than case or keg quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.

*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Mass., Boston—Samuel Marshall Inc., 43 Tremont St.—miscellaneous tools and equipment for proposed repair and service garage on Medford St. Estimated cost $75,000.

Mass., Lynn—C. Bell, 385 Broad St.—miscellaneous tools and equipment for proposed repair and service garage. Estimated cost $40,000.

Mass., North Reading—J. E. Turner—20 in. motor driven round head buzz planer.

Mich., Detroit—Dept. of Purchases & Supplies, Marquette Bldg., J. E. Mills, Comr., Purch. Agt.—plain milling machine, No. 4.

Mich., Detroit—Hupmobile Motor Car Co., East Milwaukee Ave.—stamping mill equipment for proposed 1 story addition to plant. Estimated cost $50,000.

Mich., Detroit—Warner Aircraft Corp., 4042 West Jefferson Ave.—machinery and equipment including turret lathe, etc. for machine shop.

Mo., Columbia—R. W. Wright—sheet metal cornice brake, double truss or Robinson 8 or 10 ft.

O., Columbus—H. L. Harbison Inc., 772 North High St., H. L. Harbison, Gen. Mgr.—equipment including small lathe, drill press, grinding machine, etc. for new service station.

Tex., Wallisville — Robertson-McDonald Lumber Co., Devers—machinery and equipment for proposed saw mill here. Estimated cost $75,000.

Ont., Toronto—H. W. Petrie Ltd., 147 Front St. W.—machinery and equipment for proposed garage and repair shop. Estimated cost $90,000.

Ont., Toronto—C. H. Taylor, 193 King St. E.—machinery and equipment for machine shop. Estimated cost $5,000.

Australia, Melbourne—Victorian Government Railways, will receive bids until Feb. 22 for one electrical butt welding machine complete with all necessary equipment.

N. Z., Wellington—New Zealand Government Railways, will receive bids until Apr. 21 for one 13 in. combination lathe, two capstan lathes, six medium vertical drilling machines, four vertical drilling machines, two vertical milling machines, one plate edge planing machine, two die sinking machines, three crank shaping machines, two nut tapping machines, two locomotive wheel balancing machines, two sand slinger moulding machines, one slotting machine, one hydraulic riveter for foundation rings, four electric welding sets, three pressure die and white metalling plants, two electric lifting magnets, thirty three belt driven spring power hammers and eleven pneumatic power hammers.

Opportunities for Future Business

Calif., Los Angeles — Brunswick-Balke-Collandar Co., 84 South Los Angeles St., is having plans prepared for a 1 story, 177 x 400 ft. factory and warehouse at Mines Ave. and Galada St. Estimated cost $300,000. Work will be done under the supervision of Krempel & Erkes, 538 Bradbury Bldg., Archts. Noted Dec. 29.

Calif., Berkeley—City, J. N. Edy, Mgr., plans the construction of an administration building, shops, hangars, etc. in connection with municipal airport. Estimated total cost $214,500.

Calif., Los Angeles—C. Cole, 803 North Kingsley Dr., Designer, is receiving bids for a 1 and 2 story, 100 x 150 and 30 x 100 ft. garage and service building on Figueroa St. for C. F. Kinnucan.

Calif., Los Angeles—Mesick & Mahy Mfg. Co., 1431 South Wall St. (silversmiths), awarded contract for a 3 story factory. Estimated cost $40,000. Noted Feb. 3.

Calif., Los Angeles—Schumacher Wall Board Co., awarded contract for a 1 story, 60 x 560 ft. factory at 357 West 58th St. Estimated cost $45,000.

Calif., Oakland—Weaver-Wells Co., 3321 Broadway, is having plans prepared for a 1 story, 50 x 112 ft. garage and service building at Broadway and 29th St. C. McCall, 1404 Franklin St., Archt.

Conn., Danbury—New England Transportation Co., plans the construction of a garage. Estimated cost $40,000. Architect not selected.

Ill., Chicago—Goldberg & Cohen, 2139 Ogden Ave., awarded contract for a 1 story, 77 x 101 ft. addition to auto body factory at 2133 Ogden Ave. Estimated cost $30,000.

Kan., Emporia—Atchison, Topeka & Santa Fe Ry., 80 East Jackson Blvd., plans extensions and improvements during 1928 to include repair shop, etc. here. H. W. Wagner, Topeka, Ch. Engr. (Eastern Line)

La., New Orleans—Dock Board, New Court House Bldg., awarded contract for the construction of a shop and office at foot of Canal St. Estimated cost $124,460. Noted Dec. 15.

Md., Baltimore—Bd. of Awards, will receive bids until Jan. 18 for a 3 story warehouse and repair shop at 20th and Curtain Sts. W. F. Stone, Jr., Munsey Bldg., Archt.

Mass., Cambridge (Boston P. O.)—H. N. White, c/o J. R. Worcester Co., 79 Milk St., Boston, Archt., awarded contract for the construction of a 2 story, 70 x 95 ft. repair and service garage at 25-31 University Rd. Estimated cost $60,000.

Mass., Chelsea (Boston P. O.)—Standard Box Co., 28 Gerrish Ave., is receiving bids for a 2 story, 100 x 140 ft. addition to factory. Estimated cost $75,000. Eisenberg & Feer, 46 Cornhill, Boston, Archts.

Mass., Lynn—C. Bell, 385 Broad St., awarded contract for the construction of a 1 story garage and repair shop. Estimated cost $40,000. Noted Mar. 10.

Mass., Newburyport—Morse & Dickinson, 25 Washington Sq., Haverhill, Archt., will soon receive bids for a 1 story, 50 x 180 ft. garage and repair shop on Bridge Rd. here. Owners name withheld.

Mass., North Attleboro—Universal Car Co., will build a 1 story, 60 x 100 ft. garage and repair shop on South Main St. Estimated cost $45,000. Private plans.

Mass., Waltham (Boston P. O.—T. Sullivan, 356 Main St., is having revised plans prepared for a 2 story, 60 x 100 ft. repair and service garage on Main St. Estimated cost $50,000. W. H. Haines, 32 Riverview Ave., Archt. Former bids rejected.

Mich., Battle Creek—Battle Creek Sanitorium, will build a 4 story, 88 x 128 ft. service building. M. J. Morehouse, 343 South Dearborn St., Chicago, Ill., Archt.

Mich., Detroit—Hudson Motor Car Co., Gratiot and Knodell Ave., awarded contract for a 2 story, 300 x 500 ft. sheet metal factory on Connors Ave.

Mich., Detroit—Tuller Hotel Co., Park and Adams Sts., plans the construction of a 14 story, 75 x 120 ft. garage on Bagley Ave. F. J. Hughes Co., U. B. Bldg., Dayton, O., Archt.

Mich., Pontiac—Cadillac Sales & Service Co., 121 Wayne St., is having plans prepared for a 2 story sales and service station on West Huron St. Estimated cost $200,000. Architect not selected.

Minnesota—State Highway Dept., 1246 University Ave., St. Paul, plans the construction of two 1 story highway maintenance buildings, one at Mankato and one at Owatonna. Estimated cost $30,000 each.

Mo., Bridgeton—B. F. Mahoney Aircraft Co., San Diego, Calif., will soon receive bids for a 1 and 2 story airplane factory here. Estimated cost $50,000.

Mo., Kansas City—Imperial Casket Co., 1415 St. Louis Ave., plans the construction of a 3 story, 75 x 165 ft. factory at 9th St. and St. Louis Ave. W. K. Martin, 423 Dwight Bldg., Archt.

Mo., St. Louis—Hilmer-Belcher Chevrolet Co., 1163 South Kingshighway, awarded contract for a 2 story, 77 x 125 ft. auto sales and service station.

N. J., Bloomfield—Consolidated Safety Pen Co., 46 Farrand St., will soon award contract for a 3 story, 35 x 75 ft. factory. Estimated cost $40,000. F. Y. Parsons, 1123 Broadway, New York, N. Y., Archt.

N. J., Hackensack—Owner, c/o J. L. T. Tillack, 173 Main St., is having plans prepared for a 5 story garage. Estimated cost $200,000.

O., Akron—Arcade Garage Co., c/o S. Morgenroth, Pres., is having plans prepared for a 4 story, 132 x 132 ft. garage. Estimated cost $300,000. Starrett & Van Vleck, 8 West 40th St., New York, N. Y., are architects.

O., Alliance—Hess Aircraft Co., will soon receive bids for the construction of a factory here. Estimated cost $100,000.

O., Canton—Timken Roller Bearing Co., Dulber Ave. S.W., plans addition to factory on Harrison Ave. S.W. Estimated cost $1,000,000.

O., Cleveland—Forest City Walworth Run Foundries Co., P. J. Strangward, 1220 Main St., awarded contract for a 2 story, 82 x 110 ft. foundry on Swift Ave. Estimated cost $50,000. Noted Dec. 22.

O., Columbus—Bd. of Trustees, Betelle Memorial Institute, H. M. Runkle, Treas., 186 East Broad St., is having plans prepared for a 3 story college including machine shop, etc. on King Ave. Estimated cost $250,000. O. C. Darst, 150 East Broad St., Archt.

Okla., Sapulpa—Burt Mfg. Co., Mayo Bldg., Tulsa, had preliminary plans prepared for the construction of an oil well swab factory here. Estimated cost $75,000.

Pa., Ardmore—J. L. Canarroe, 225 South Sydenham St., Philadelphia, Archt., will soon award contract for the construction of a sales and service station here. Owner's name withheld.

Pa., McKeesport—Fort Pitt Steel Castings Co., awarded contract for a 1 story, 60 x 300 ft. addition to factory. Estimated cost $40,000.

Pa., Philadelphia—Felt Bros., Packard Bldg., awarded contract for a 1 story, 102 x 206 ft. sales and service station at Ogontz and Barnett Sts. Noted Dec. 15.

Tex., Dallas—J. E. Mitchell, c/o J. A. Pitzinger, 1101 Southwestern Life Bldg., Archt., is having plans prepared for a 2 story, 100 x 214 ft. factory for the manufacture of gin machinery at Lamar and Austin Sts.

Wash., Seattle—Allis-Chalmers Mfg. Co., Clinton St. and National Ave., Milwaukee, Wis., plans the construction of a 3 story, 60 x 150 ft. factory at First Ave. S. and Atlantic St. here. Estimated cost $100,000.

Ont., Sault Ste Marie—Algoma Steel Corp., plans extensions and improvements. Estimated cost $12,000,000.

Ont., Toronto—Swaze Art Craft Top Co., 9 Bloor St. E., manufacturers of auto tops, plans the construction of a 2 and 3 story factory on Yorkville Ave. Estimaetd cost $50,000.